# THE EXTENSION BULLETIN

Issued Monthly by the Department of Agricultural
Extension of The Pennsylvania State College

Application for admission to second class matter pending.

Vol. I JANUARY, 1914 No. 4

In point of interest and numbers in attendance, the Farmers' Week which closed on the 3rd of the month was one of the most successful ever held. The total registration was 980—84 of whom were women. Sixty-two counties of the state were represented. The following table shows the growth in numbers since Farmers' Week was inaugurated:

| Year. | Registration. | Counties. |
|---|---|---|
| 1906-07 | 185 | 36 |
| 1907-08 | 400 | 50 |
| 1908-09 | 458 | 55 |
| 1909-10 | 563 | 56 |
| 1910-11 | 474 | 58 |
| 1911-12 | 587 | 57 |
| 1912-13 | 678 | 59 |
| 1913-14 | 980 | 62 |

## GIVING THE COWS A CHANCE

Thousands of new dairy farmers are asking each year some of the general principles of feeding dairy cows. Many others with years of experience like to review these same principles of feeding which they have found out after years of trial.

**The Original Dairy Cow:** By breeding, feeding and selection man has developed the dairy cow of today from wild forms formerly living in Europe and Asia and which gave only milk to support their calves. Many cows still fail to secrete enough milk to pay for their keep and are known as "Boarders." The ability of a cow to give milk matters little unless she is abundantly supplied with the material from which milk is made. That cow is the best and most economical that can transform the largest amount of food into a correspondingly large amount of milk. Very little time is required to weigh the milk of each cow every day. By so doing and using the Babcock Test it is possible to find out the cows that have inherited the proper dairy qualities. The system is practical and no dairyman can any more feed a cow intelligently without scales to weigh the milk than he can fire a boiler without a steam gauge.

**Give an Abundance of Palatable Food:** Maintenance is a certain definite amount of food necessary to maintain the processes essential to life without gaining or losing in weight, without growing a foetus, without giving milk or doing work of any kind. The amount of milk which a farrow cow gives is directly proportional to the amount which she can eat above maintenance up to the limit of her milk-making ability.

The successful feeder is the one who can get his cows to eat a large amount above maintenance and still not have them go "off feed." In order to have cows eat a large amount of food it must be palatable. The dairyman wishes to see the cow increase in her flow of milk up to the limit of her capacity to eat and digest. The more of these cows that a dairyman has the better. Many cows will increase in milk for a time as the feed is increased and then put on fat as the feed is still further increased. These cows may often be profitable provided the feeder stops the increase in the feed supply at the point where the cow would put on fat. Too often a cow gains only in weight and the milk remains the same. This cow is suited only for beef production. The feeder must remember that from 40-60 per cent. of all any cow can eat goes for maintenance and that it is only that feed above this that ever returns him any profit. Most dairy cows in the country are underfed. Authorities state that milk production in the United States could be increased from one-half to three-fifths by proper methods of feeding alone.

**Select at Least One Succulent Feed:** Feeds which have the property of being especially moist as pasture grass are spoken of as succulent. Such feeds have a favorable effect upon the digestion of the animal. When cows are off of pasture the cheapest succulent feed on the farm as a rule is silage.

Roots, if available, are excellent and have the desired effect, but are usually too expensive unless labor is cheap. Dried Beet Pulp, moistened, also has the desired effect, but is expensive. When silage is fed, 15 to 45 pounds a day can be given according to the amount of milk secreted and the appetite of the cow. When more than 20 pounds of silage is fed per day per cow it should be fed at two meals. The same amount of roots could be fed. As a rule roots are chopped or sliced before feeding. From 1½ to 6 pounds of the Dried Beet Pulp is fed per cow. Some feed the soaked Dried Beet Pulp by itself, others mix the grain with it.

**Select Two Roughages if Possible:** If possible two kinds of roughage should be fed, as for instance, clover hay and corn stover. Pennsylvania is in a semi-corn belt and hence, as a rule some corn stover is fed on nearly every farm in the state. Four or five pounds a day of stover should be made the limit, and then feed all the hay that the cows will eat up clean. This for an average cow will be about as much more. Stover should not be used for milch cows if the supply can be used up in feeding other stock.

**Select Three or Four Feeds for the Grain Mixture:** If prices permit there should be four different feeds in the grain mixture. This is to give variety. As a rule, corn meal or hominy should be one of these as they are, at present prices, the cheapest source of energy. Cottonseed Meal can well be another, for it generally supplies protein the cheapest. Some feed should be added to give bulk, like bran, distillers' dried grain and the like. It is all right to add from 1 to 2 pounds of salt to each 100 pounds of the grain mixture. It is a good rule to feed one pound of the grain mixture for each three to four pounds of milk given.

**Select Feeds that Contain the Necessary Constituents in the Right Proportion:** The feeder must be careful to see that in selecting his feeds he furnishes protein and net energy in such proportions and amounts as will properly, and without much excess of either, nourish the animal being fed. A definite amount of protein per day is needed to maintain the body protein and a certain definite amount in addition to furnish the curd of the milk. If too little protein is fed to supply this the yield of milk will drop because a cow always secretes milk of the same composition. One cow differs from another, but it is constant for a particular cow. As protein is expensive he cannot afford to feed much excess. In like manner too little net energy will cause a drop in milk production and an excess will cause the cow to put on fat. Tables giving the proper amount of each for different amounts of milk and for varying per cent. of fat can be had in Bulletin 114 of this Station.

**Select Feeds That Are Cheap:** It is not the cost price per ton for feeds which determines their cheapness, but rather the relative cost of protein and net energy in the different feeds. Here again tables can be obtained which give the amount of protein and net energy in the ordinary feed stuffs. Each feeder must then figure the cost of protein and net energy in these feeds at his prices. The cost account is always a local matter and can only be determined on the particular farm. It will even vary month by month as the cost of a particular feed goes up or down. Every feeder should realize that this cost item is his greatest problem. He may even find that he can afford to sell materials raised on his own farm and buy some others. This is very often the case with timothy hay. This feed because of its value for horse feeding has a much higher value for the actual protein and net energy which it contains than is the usual case with clover hay, which is generally avoided by the horse feeder. To illustrate, 100 pounds of timothy hay contains 2.05 pounds of digestible protein and 33.56 therms of energy. If timothy hay costs $16.00, per ton, 100 pounds of protein in timothy hay would cost $39.00, and 100 therms of energy would cost $2.38. In the case of clover hay, 100 pounds contain 5.41 pounds of digestible protein and 34.74 therms of energy. Assuming that clover hay at the same place cost $15.00, per ton, 100 pounds of protein in the clover hay would cost $12.94, and 100 therms of energy would cost $2.16.

This same method of figuring should be used for every feed. The roughages, as a general rule, must be the ones grown on the farm and hence are the ones which can be raised the most economically. This is not true of the concentrates on most Pennsylvania farms. Some of the corn can be grown, but the rest are usually bought and by a little time spent in figuring the cost of protein and energy it may be possible to save a hundred dollars in a year on an ordinary sized farm.

In general then every feeder should keep in mind—to feed as nearly as possible a balanced ration in proportion to the amount of milk given, and to be sure to feed enough, keeping a strict account as to the cost of the ration, while seeing to it that it has a proper variety, bulk and succulency.

# THE EXTENSION BULLETIN

Issued Monthly by the Department of Agricultural
Extension of The Pennsylvania State College

Application for admission to second class matter pending.

Vol. I FEBRUARY, 1914 No. 5

There are now enrolled in the entire College 2302 students. Eleven hundred and twenty-five of these students are in the School of Agriculture.

There has never been a time when the need for room was more emphasized. With the additional number of students which the Sophomores taking agriculture bring to the School at the opening of the second semester, February 2nd, 1914, the finding of sufficient recitation rooms is an exceedingly difficult problem. The new Horticultural Building will be completed early in the spring. During the summer the new stock judging pavilion and a dairy barn will be erected. This will give additional room but will no more than care for the normal growth which will take place by the time these new structures are completed.

## THE FARMER'S GARDEN.

**Good Seed.**—Good seed is one of the first and most important requisites to good gardening. In order to get good seed, the grower should secure his seed supply early and not wait until the last minute when the supply is usually low and the best seed picked out. Purchase seed from reliable seedsmen or from a dealer who handles reliable seed, in order to be certain of varieties.

**Germination Test.**—It is an excellent practice to run a germination test to determine the viability or germinating power of seed. If this is done early and the seed does not measure up to your expectations, new seed from another source can be secured before it is too late in the season. The lack of such test may mean a partial or even a total failure of the crop.

A good method to follow in making a germination test is to count out 100 seeds and place them between damp blotters kept at a temperature of from 65 to 70 degrees Fahrenheit for cool vegetables like cabbage and lettuce, and from 75 to 80 degrees Fahrenheit for warm vegetables like tomatoes, eggplant and peppers. Another method is to place the seed on damp sand and cover it with a damp cloth; the former method, however, is a little simpler. Of good seed, from 85 to 95 per cent. should germinate, that depending to some extent on the vegetable. If only 40 or 50 per cent. germinate, new seed should be secured; this fact shows low vitality and very likely poor, weak plants will be the result.

**Plants.**—Early plants should be started in the hotbed, greenhouse or kitchen window. The preparation of the manure for the hotbed is important. The pit which is usually made the size of the frame should be dug in the fall as conditions during the late winter or early spring are very often unfavorable for digging. Horse manure is undoubtedly the best to use and is also readily available to the farmer. The proportion of excrement to litter should be two parts excrement to one of litter. Fermentation should begin before the manure is put into the pits. In order to bring this about, pile the manure in rectangular form; for example, make the pile about 4 feet wide, 4 feet high and 8 feet long and place it under shelter. If fermentation does not begin in three or four days, increase the supply of moisture by the use of hot water. After the middle of the pile has started to heat, restack it, placing the manure which is on the outside of the pile in the center of the new pile. Allow fermentation to begin in the new pile and then place the manure in the pit, being careful to tramp it thoroughly. The manure should be in a uniform state of fermentation throughout.

**Soil.**—With seed sown in hotbeds, great care should be taken in preparing the soil. The latter should contain a great amount of humus in order that the bottom heat produced by the manure can pass through the soil and warm the air above. Humus has been termed "the reservoir of moisture," and as the soil of the hotbed is particularly inclined to dry out, because of the heat, a porous soil retentive of moisture should be used. A soil composed of about one-third ordinary garden loam, one-third sand and one-third well-rotted manure is excellent for the starting of plants. When plants are transplanted, a heavier and richer soil should be used. From three to four inches of soil should be used in the hotbed.

**Seeding.**—The seed may be sown broadcast or drilled in rows. The common practice is to broadcast the seed and then to thin the plants so that they will grow nicely to a suitable size for transplanting to the field. After the manure is spent, the hotbed will serve as a cold-frame. A better plan, however, is to sow the seed in boxes, 2½ inches deep, setting the boxes directly on an inch of soil spread over the manure. The seed is usually sown in drills, 10 to 14 seeds to the inch, and covered ¼ inch deep for ordinary vegetables like lettuce, cabbage, peppers, eggplants and tomatoes. On account of its small size, celery seed should barely be covered, and preferably with sand.

**Transplanting.**—When the first true leaves appear on the seedlings, they should be transplanted from 1½ to 2 inches apart in similar boxes containing rich soil. They are allowed to remain in these boxes until they are set out in the garden; especially is this practiced with cabbage and lettuce. Tomatoes, peppers and eggplants are often reset in pots since they cannot be planted in the open until later in the season.

The method just described is practiced extensively in greenhouses where the plants can be started very early in the year and where conditions for transplanting can be easily governed. The window garden is governed by the same conditions as are necessary for the greenhouse, but on a small scale.

**Hardening the Plants.**—Forced vegetable plants in greenhouses or in the ordinary kitchen window, are very susceptible to cold, owing to their rapid growth under high temperature, and before they can be set out in the open must be hardened to outdoor conditions. This is accomplished by the use of a cold-frame, which has the outward appearance of a hotbed but is not heated artificially. The boxes of plants are set inside these frames; by means of glass the plants are protected on chilly nights, and have the benefit to the sun's rays during the day. This process is the necessary intervening step between the tender hothouse plant and the hardy outdoor plant.

In handling plants in hotbeds and cold-frames, the moisture and heat conditions, which include ventilation, are of the greatest importance. Supply plenty of ventilation during the day, but close the frames tightly at night before the temperature begins to drop. Too much moisture combined with high temperature provides ideal environment for fungous diseases.

**Time of Seeding.**—The time of sowing seed for early plants varies in different parts of the state.

In greenhouses seed of such plants as peppers, eggplants and cabbage should be sown in the early part of February, and that of tomatoes the latter part of February. Cabbage and lettuce can be transferred to the cold-frames about the middle of March. Vegetables requiring warmer conditions should remain in the greenhouse several weeks longer.

Ordinarily, seed of vegetables adapted to cool conditions can be sown in hotbeds about the middle of March; the date of sowing will vary several weeks, however, in the northern and southern parts of the state and will also be governed by the season to some extent.

**Fertilization.**—Soil that is to be planted to vegetables should have special treatment the previous year. A good plan is to plow down an application of manure in the fall. This will leave the soil in an open, porus condition during the winter to absorb large quantities of water, and it will also dry off earlier in the spring and can be worked at an earlier date. A second application of manure should be turned under in the spring. One is not likely to incorporate too much manure under ordinary conditions. From twenty to forty tons per acre is a suitable quantity to apply. A cover-crop such as clover, vetch, rye, rape, millet, soy-beans and cow-peas may be sown during the latter part of the summer and turned under in the early spring together with a good application of manure.

If intensive gardening is to be practiced, a good method is to work into the soil, when pulverizing it, about 1200 or 1500 pounds of a good complete fertilizer. One containing four per cent. nitrogen and eight to ten per cent. each of phosphoric acid and potash should prove satisfactory. Nitrate of soda may be applied later as a stimulant for particular crops that may be a little backward or that it is desired to force to market, like cabbage, lettuce, endive, spinach, Brussels sprouts and chard.

**Cultivation.**—Too much emphasis cannot be placed on the thorough preparation of the seed bed. It should be worked and reworked until it is as fine as it is possible to make it.

Thorough cultivation is important to keep down the weeds, to conserve moisture and to assist in making plant food available. A dust mulch should be kept at all times, unless it seems best to mulch with manure or straw as is sometimes done with such vegetables as celery and lettuce.

# THE EXTENSION BULLETIN

Issued Monthly by the Department of Agricultural
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Application for admission to second class matter pending.

Vol. I MARCH, 1914 No. 6

Inquiries are being received from many persons who contemplate entering the two years' course next September.

Students are admitted to this course by the Dean of Agriculture without examination. Applicants are required to be 18 years of age and to give satisfactory evidence that they are sufficiently well prepared in secondary school subjects to enable them to pursue the course with profit. Some high school training is preferable, although by hard, faithful work a few students have succeeded fairly well with only grammar school training.

An additional requirement for admission next September, will be that of at least one summer's experience on a farm.

If a student has completed a four years' course in a high school, or its equivalent, and is prepared to enter the Freshman class, the desirability of taking a four years' course is urged.

The winter courses in agriculture of 1913-14 closed February 27. The bulletin giving information about these courses for 1914-15 will be ready for distribution June 1.

## THE FERTILIZATION OF APPLE ORCHARDS.

The experiments of the Pennsylvania Experiment Station, covering the past seven years and located in the leading apple-producing sections of the state, have shown that the fertility needs of an orchard may be the most serious check on its production. During the past five or six years, variations in fertilization alone have resulted in average increases ranging from 50 to 370 bushels per acre annually. These results were accompanied by corresponding differences in the growth and general vigor of the trees.

**Fertilizer.**—On the basis of these experiments, it is recommended that stable manure be applied annually to bearing apple trees, at the rate of approximately eight tons per acre, or that a commercial fertilizer containing about 6 per cent. of nitrogen, 10 per cent. of phosphoric acid and 5 per cent. of potash, be used at the rate of about 500 pounds per acre. For young trees, these amounts should be reduced in proportion to the reduction in area covered by the fertilization. Should one desire to mix his own fertilizer, that may be done by the use of sufficient materials to carry 30 pounds of nitrogen, 50 pounds of phosphoric acid, and 25 pounds of potash per acre. This amount of nitrogen may be carried in a combination of 100 pounds of nitrate of soda and 150 pounds of dried blood, or its equivalent. This combination induces a quick action; is quite thoroughly utilized by the trees, if applied at the right time; and the effect is prolonged by the dried blood, thus giving a result similar to that of two successive applications of nitrate. The same effect may be obtained by the use of tankage or any other satisfactory organic material that will carry an equivalent amount of nitrogen. The nitrogen may be obtained wholly or partially by the use of stable manure or leguminous plants, if they are available. In the Pennsylvania experiments, however, the artificial applications of nitrogen have been more effective than those obtained by the use of leguminous cover-crops. This fact may be accounted for by the probability that the reduction in moisture, occasioned by the growth of the cover-crops, apparently neutralizes the benefits which should be secured from the additional nitrogen fixed by the cover-crops. This effect, however, may not be apparent in all soils.

The phosphoric acid prescribed by the above formula may be carried in one of several materials: as, for example, 350 pounds of acid phosphate, 200 pounds of bone meal, 300 pounds of basic slag, or 200 pounds of floats. It is not possible to say at this time whether there is any important difference in the action of any of these materials.

The potash may be carried in 50 pounds of muriate of potash. When it is known that this ingredient is required by the soil, the amount may be increased as needed, and where the results indicate that it is not needed, it may well be omitted.

**Time and Method of Application.**—The time of application is important, especially in the case of the nitrates. Present evidence indicates that these materials may often be applied too early in the season. Furthermore, there is evidence which leads to the opinion that distinct harm may result from their application at fruit-setting time; especially is this true in the case of the peach. It seems, therefore, that for apples the nitrates should be applied not earlier than fruit-setting time, and probably not later than the middle of July. In general, the middle of this period should do very well, although some most striking results have come from applications made as late as the 8th of July.

Manure or other organic carriers of nitrogen may be applied at any time from early spring to the middle of June without danger of material loss or ill-effect. The time of application of the other ingredients of the general fertilizer suggested, is much less important: hence they may be applied with the carrier of the nitrogen.

By postponing the application of fertilizers, an opportunity is given to vary the rate in accordance with the amount of fruit set on the trees. If the crop is light, much smaller applications are required because of the natural tendency to develop a sufficient number of fruit buds in the off year. If the crop is heavy, the applications should be raher liberal in order to avoid, if possible, the total failure of the crop the following year, and ultimately to steady the yields. This plan should save considerable outlay in a series of years, and should also enable one to secure the greatest possible return for the fertilizers applied.

The method of application followed is that of scattering the fertilizer or manure broadcast over the surface of the soil, care being taken to keep it at some distance from the tree trunk, where there are few absorbent roots, and to extend the applications well beyond the spread of the branches. The application should be heaviest under the outer two-thirds of the spread of the branches, and it may either be left on the surface to be washed in by the rains or it may be harrowed or lightly plowed into the soil. After all is done, it should be remembered that the fertilizer applied in any given season cannot materially affect the yield of the year in which it is applied, since the fruit buds are formed in the later part of the preceding season. No important results, therefore, should be expected before the following season at the earliest, and if other conditions are not satisfactory, the results may not appear until considerably later.

**Adjusting the General Fertilizer to Local Needs.**—Where the orchard interests are large, it is advisable to accompany the use of the general fertilizer suggested with a local test in order to determine the exact needs of the particular orchard involved. Such tests will enable the grower to so modify the general formula as to give the best possible net results. To be of value, a test of this kind requires some labor, but there is no other way in which one may become fully acquainted with the needs of his orchard; in cases, therefore, where the income from the latter is important, the time thus spent should be most profitable. The details required for the test are as follows:

### Plan for Local Orchard-Fertilizer Test.

(Pounds of Fertilizer for a Mature Tree in Bearing).

1 Unfertilized plat.
2 Nitrate, 2½ lb.; dried blood, 3½ lb.; acid phosphate, 10 lb.
3 Nitrate, 2½ lb.; dried blood, 3½ lb.; potash 2 lb.
4 Acid phosphate, 10 lb.; potash, 2 lb.
5 Unfertilized plat.
6 Nitrate, 2½ lb.; dried blood, 3½ lb.; acid phosphate, 10 lb.; potash, 2 lb.
7 Same as No. 6, plus lime, 12 to 25 lb.
8 Manure, 400 lb.
9 Unfertilized plat.

The plats selected for this test should be located in a typical part of the orchard, and should include at least six average trees of the same variety and age for each formula. They should preferably be laid out in double rows of three trees each, and if two or more varieties are involved each plat should be arranged to include equal numbers of each variety. All trees should be labeled and carefully measured at a fixed point on the trunk, and definite records of their yields and growth should be kept for at least three years. Frequently, indications of the needs of an orchard may be obtained in less time, but this period of time at least should be allowed and a longer one should be used if necessary.

The materials for this experiment are indicated in quantities proper to apply to each bearing tree instead of in amounts per acre, as above, and the same proportionate reductions should be made for younger trees. In other words, if only one-third of the ground is to be covered, then only one-third of the amount of fertilizers recommended should be used, so that the rate of application may be kept within proper bounds. The careful operation of this test for the period suggested should determine whether fertilization really pays, and which of the principal fertilizer elements is important, in any particular orchard.

# THE EXTENSION BULLETIN

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Vol. I APRIL, 1914 No. 7

The College has just assumed control of two additional farms, which adjoin its present property and aggregate 378 acres. The total land area now controlled by the institution—exclusive of campus and grounds which contain about two hundred acres—is twelve hundred and forty-six acres. For extensive experiments in farm crops, orchards, and vegetable gardening, and more especially to provide feed for the live stock which it is necessary to keep in large numbers, this large acreage is essential.

A full equipment of live stock as a basis for student instruction is indispensable. Practical work in the judging of live stock is offered to all agricultural students; it is required of all those students who are specializing in animal husbandry or dairying. This necessitates the maintenance of large herds of beef cattle, sheep, and swine. For the efficient management of the general farm work and for experimental and instructional purposes, a large number of horses are required. To provide a part of the immense quantity of milk needed for experimentation and instruction in creamery and dairy work, a large herd of dairy cows is demanded.

At present, the live stock belonging to the College includes 121 beef cattle, 120 hogs, 115 sheep, 125 dairy cattle, and 40 horses. Large flocks of poultry are also included in the equipment.

The growth of the institution and the development of a wider field of research will make imperative the acquirement of additional land and equipment.

## TESTING SEED CORN

Good seed is a very important factor in raising large yields of corn. The soil may be fertile, but if the stand of plants be poor the result will be a comparatively low yield. The following table will show the possibility in yields of shelled corn when ears of different sizes are grown.

## The Relation of Stand to Yield.

| | | |
|---|---|---|
| No. of stalks to the acre (average planting) | 10,665 | |
| 1 lb. ear to the stalk with perfect stand | 152.4 | bushels per acre. |
| 1 lb. ear to the stalk with 80% stand | 121.9 | bushels per acre. |
| ¾ lb. ear to the stalk with 80% stand | 91.5 | bushels per acre |
| ½ lb. ear to the stalk with 80% stand | 60.9 | bushels per acre. |
| 4.8 oz. ear to the stalk with 80% stand | 36.5 | bushels per acre. |

36½ bushels of ear corn represent Pennsylvania's average yield for the last ten years.

Although great care may have been taken in the selection and storing of seeding corn, one will secure the best results by testing each ear in the spring to make sure that it will grow. There are about 900 kernels on the average ear. If four or five of every hundred ears planted lack vitality, the result will be at least 2000 fewer stalks in the field per 100 seed ears planted.

Figure 2 shows a hand-made germinator that has proven very satisfactory. A germinator with inside measurements of 30x20 inches and 3 inches deep is very convenient. Notches one inch deep should be sawed every two inches along the sides and ends of the box, numbers from 1 to 15 placed between the notches on the sides, and letters from A to U on the ends. Two inches of damp sand or sawdust should be placed in the box; this material is then separated into two-inch squares by a string passed forward and backward through the notches in the sides and ends of the box, and each square is given a number.

Six kernels from each ear should be tested. The one making the selection should take a kernel near the tip; turn the ear one-sixth around and take a kernel in the middle; turn one-sixth again and take another kernel near the butt; turn another sixth and repeat process. Such a test will determine the seed condition at all locations on the ear. The six kernels are placed in one of the squares of the box. The number of the square is then placed on a small piece of ordinary paper or cardboard and this tag is pinned to the butt of the ear. When the box is filled, a cotton cloth should be laid evenly over the kernels and another inch of damp sand or sawdust placed on top of the cloth.

In conducting such a test, it is very essential that the germinator be placed as nearly as possible under *Field Conditions.* A temperature of 55 or 65 degrees Fahrenheit in a building will correspond

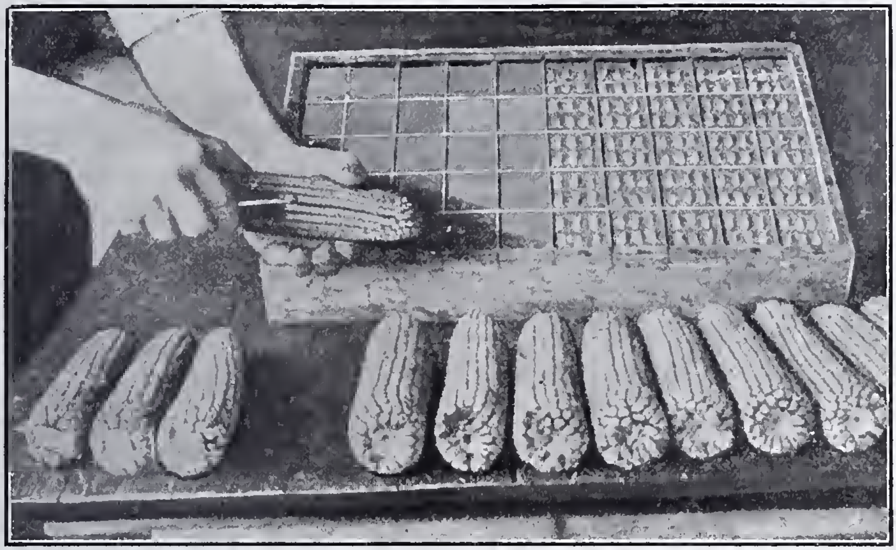

Fig. 1. Method of lifting kernels from the ear preparatory to making test. Three ears on the left marked as described.

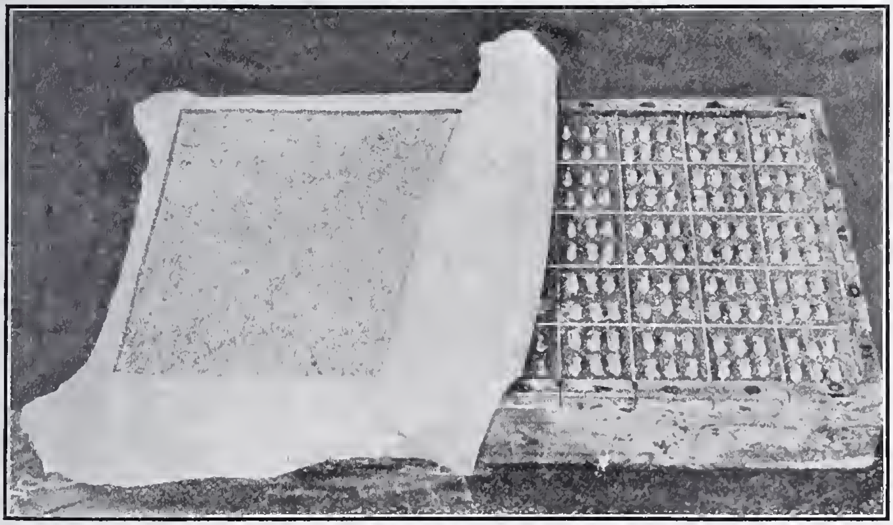

Fig. 2. A convenient box germinator. A sure method for detecting dead ears.

to the temperature of the soil at planting time. After a week or ten days the cloth may be rolled back and the kernels examined. Any ear which has failed to germinate perfectly should be discarded.

**Preparation of the Seed for Planting.**—It is best to shell seed corn by hand. The tip and butt grains should be discarded, since uniformity of shape and size of kernel are necessary for accurate work from the planter. The planter should be adjusted to each grade or size of kernel to insure an even stand in the field, since this is one of the most important factors in producing a large yield.

**Planting.**—The time for planting corn will vary according to the season and the location. In most northern states, it has been found that, under average conditions, the largest yields are obtained from early planting. The Indians planted maize "when the leaves of the oak trees were of the size of a squirrel's ear;" this is a good rule to follow for the soil is then warm enough to produce germination.

The depth of planting will vary somewhat with the season and type of soil. If the soil is a clay loam, and there is plenty of available moisture, one inch will probably be the best depth. If the soil is light and open, or the season dry, the seed must be planted deeper in order that it may obtain sufficient moisture to produce germination. Ohio experiments show that the best results have been obtained when corn was planted at a depth of about one and one-half inches. Deep planting produces a weak, undesirable plant because most of the plant-food in the kernel is used before the young plant comes through the soil.

# THE EXTENSION BULLETIN

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Vol. I MAY, 1914 No. 8

## AVAILABLE BULLETINS

For the information of our readers the following list of available bulletins is given. Requests for these bulletins should give the number and be addressed to School of Agriculture, State College, Pa.

No. 72—Experiments in Growing Sumatra Tobacco.
No. 96—A Cabbage Strain Test.
No. 97—Milling and Baking Tests of Wheat.
No. 101—Meadows and Pastures.
No. 104—The Respiration Calorimeter.
No. 105—Influences of Type and Age on Utilization of Feed by Cattle.
No. 108—Variety Tests of Oats.
No. 110—Control of Insect Pests and Plant Diseases.
No. 115—Lime-sulphur Spray.
No. 116—Corn-Growing in the East.
No. 117—Feeding Draft Horses.
No. 118—Silage for Steers: Wintering Beef Breeding Cows.
No. 119—Strain Tests of Cabbage.
No. 120—Poultry Experiments.
No. 121—The Fertilization of Apple Orchards.
No. 122—Developing Draft Colts.
No. 123—Tuberculosis.
No. 124—Steer Feeding Experiments.
No. 125—Variety Tests of Wheat.
No. 126—Food as Body Fuel.
No. 127—Pennsylvania Limestone and Lime Supplies.
No. 128—The Apple in Pennsylvania.
No. 129—A Strain Test of Tomatoes.

## PRESERVE THE BULLETINS

Many, if not most, of the research bulletins are more valuable for reference than for straight reading matter to be dropped as soon as read. The desirability of filing all these publications for future reference is urged upon our readers. Frequently questions arise about which immediate information is needed and concerning which something has been read in a bulletin, but the bulletin has not been kept. The issues are frequently out of print when requests for additional copies are made. If all bulletins are put away systematically in numerical order they are always available for reference.

## PREPARATION FOR ALFALFA

An acre of alfalfa produces twice as much digestible nutrients as an acre of good clover, the digestible protein being three times as great. It makes good yields through a number of years. These facts justify efforts to grow it. Alfalfa grows well on a variety of soils. There must be drainage, fertility and lime. The seed-bed should be firm, moist, and as free from weed seeds as possible. It is not desirable to break a grass sod for alfalfa without rotting the sod and destroying all grass. The sod may be given a heavy dressing of manure and planted to a cultivated crop. The land may then be plowed for alfalfa the following May or June. Harrowing to preserve moisture and destroy the weeds, should be given frequently up to the time of seeding.

Experience indicates that August seeding—from the 1st to the 15th—gives the most satisfactory results. It is recommended that 24 to 30 pounds of good seed per acre be used. Soil from a successful field of alfalfa may be used for inoculation. This inoculated soil should be taken a few inches below the surface, and should not be exposed to hot sunshine or drying winds. It should be broadcasted and worked into the surface soil a short time before seeding. Five hundred to 1000 pounds of soil per acre may be used. If for any reason it is expensive a smaller amount will do.

## MAKING ALFALFA HAY

The curing of alfalfa for hay is more difficult than that of other grasses. The proper time for cutting is determined by the blossom and the start of new growth. Usually when blossoms begin to appear the alfalfa is ready for cutting. At this time, the plant will begin to send out small shoots from the crown just above the ground. These should be from one to one and one-half inches long when the alfalfa is cut. The mower will clip the second growth if too long and this must not occur.

It is well to directly follow the mower with the tedder, tedding a second time at right angles. This lifts the alfalfa from the damp ground and allows free circulation of air. The following morning, before the dew is off, ted again. The second morning after cutting, ted again. If the two previous days have been good curing days, the alfalfa can be raked into small windrows. About noon, pile in small heaps where the final drying can take place. By the middle of the afternoon, the alfalfa should be ready for the mow.

Where a small acreage is handled, alfalfa can be cut and left in the swath until thoroughly wilted and then piled and covered with caps. These caps may be made from unbleached muslin forty-two inches square. The alfalfa may be left under them until it has gone through the sweating stage and is thoroughly dry. One objection to this plan is the smothering of the young alfalfa under the piles. This may sometimes be overcome by placing the piles on stools made for the purpose, or by moving them once every two or three days. Two men can lift an entire pile with forks and move it easily without removing the cap. The last two methods are expensive, and except with a small acreage are impracticable.

It is important that alfalfa be not handled when dry enough to loose leaves, excepting as it must be handled in hauling to the mow.

If, after cutting, there are heavy dews at night, the alfalfa will bleach. The only way to overcome this is to pile and cap or to pile in the evening and open the piles in the morning.

If there is much rain, it is almost impossible to make good hay. In that event, it is necessary to turn the alfalfa at least every other day to prevent it from becoming slimy. Under these conditions alfalfa will turn brown, but following the rain it can be cured in the same way as previously described.

In case of the second, third, or subsequent cuttings, if the haying conditions are good, the length of time involved in curing may be reduced.

## SEASONABLE SPRAYING

The first spray for fungous troubles of apples and pears, should be given with lime-sulphur solution, just as the pink is showing in the blossom buds. For fungous diseases alone, use lime-sulphur at the rate of about 1 to 38, of the commercial concentrate, or 1 to 30 of the home-made product. If the canker-worm or bud-moth is likely to be present, add lead arsenate at the rate indicated below.

As soon as the petals have fallen from apple and pear blossoms, the trees should be sprayed to control the apple-worm. Arsenate of lead at the rate of two to two and one-half pounds of the paste,—or one pound of the powder,—to fifty gallons of water, or some other spray material, such as Bordeaux mixture or diluted lime-sulphur, should be used. Arsenate of lead in combination with lime-sulphur is probably the best spray to use just after the petals have fallen. Dilute the commercial concentrated lime-sulphur in about the following proportions: one gallon of the stock solution to thirty-five gallons of water. In applying this spray to apples or pears, use as high a pressure as possible with a nozzle that throws a comparatively heavy spray. The modern disc type of nozzle, with a fairly large aperture, is preferable if sufficient pressure is available. For hand pumps and with clear spray materials, the Vermorel nozzles are quite effective. The coddling moth, after it hatches from the egg, seeks the blossom or "blow end" of the apple and enters the young fruit. This may be prevented by careful spraying at this time with lime-sulphur and arsenate of lead. The lime-sulphur will help to keep the foliage clean and the fruits free from fungous diseases. This is the most important spray of the entire season.

For the spraying of peaches, plums and cherries, wait until all the husks or calyces have dropped off the young fruits. At this time give the trees a thorough spraying with self-boiled lime-sulphur (8-8-50 formula), to which has been added two and one-half pounds of paste arsenate of lead,—or its equivalent of powdered arsenate of lead,—to every fifty gallons of spray material.

## PENNSYLVANIA AT THE NATIONAL CORN SHOW

At the National Corn Show held in Dallas, Texas, Pennsylvania was awarded first prize for the best ten ears of Yellow Dent and White-Cap Yellow Dent, as well as for the best single ear of corn in the eastern zone, which comprises the New England States, New York, New Jersey, Delaware, Maryland and Pennsylvania. Maryland secured the decision for the best ten ears of White Dent. The sweepstakes for the best ten ears of any Dent Corn went to Maryland.

This does not maintain for our state the reputation which her corn-growing possibilities warrant. There is no good reason why Pennsylvania should not secure and maintain supremacy. Of course last season was not favorable, but other states had the same handicap. We believe Pennsylvania has corn which could have won sweepstakes this year, had it been exhibited.

**A Suggestion**—All corn to be entered in competition in the National Corn Show must have been shown previously in a State Show. Many local and county shows are not held until after the State Show which usually occurs at the time of the meetings of a number of the state agricultural associations, in January. If these local exhibits could be held earlier, and if a larger number of local shows could be organized, more corn could be sent to a state "round-up," thus increasing the interest and value of such meetings. A more representative exhibit of corn would then be available for the National Exposition. This is a matter in which all Pennsylvania farmers should take some pride.

# THE EXTENSION BULLETIN

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Vol. I JUNE, 1914 No. 9

The Pennsylvania Railroad is arranging for a number of excursions to the College during the early part of June.

The dates for Farmers' Week the coming winter are December 28 to January 2. Among the new features will be a separate section for the boys and girls. Plans are also being made to hold a Country Pastors' Conference at this time.

The Summer Meeting of the State Horticultural Association of Pennsylvania will convene at State College June 17 and 18, 1914. The meeting will afford a splendid opportunity for the members of the Association to see the work which is being done in the various departments of the College. The long-time fertilizer experiments, the cover crop and sod mulch versus clean cultivation treatment in the young experimental orchard, the student gardens where the young men and young women work out many intensive schemes of rotation and inter-cropping, and the plats of the various strain tests of vegetables now being carried on by the Department of Horticulture, should prove of special interest. The College greenhouses will also be a matter of general interest to many of the members.

The program will consist of a number of practical talks on horticultural subjects and the routine business of the Association. All members of the Association are urged to be present and take a part in the meetings.

The College extends a cordial invitation to every person who can be present at this time.

## A NEW APPOINTMENT.

Professor Maurice G. Kains, Associate Editor of the American Agriculturist, has been appointed Professor of Horticulture at The Pennsylvania State College and will report for service August 1st, although two weeks will be spent at the College during the month of June.

Professor R. L. Watts has been acting as head of the Department, as well as in the capacity of Dean, for a year and a half, or since his elevation to the Deanship.

Professor Kains graduated from the Michigan Agricultural College in 1895; he spent the following two years at Cornell University, pursuing post-graduate work, and obtained at that institution the degree of Master of Science. After the completion of his work in Cornell University, he served three years in conducting special crop investigations for the United States Department of Agriculture. During this period he made a thorough study of special crop problems along the Atlantic Seaboard, and also made several trips to Bermuda to investigate problems which were being studied by the United States Government. In 1900 he accepted the Chair of Horticulture at the School of Practical Agriculture and Horticulture at Briarcliff Manor, New York, where he taught, in addition to horticulture, botany, entomology and some other subjects. After two years of teaching, he became horticultural, agricultural and botanical editor of the New International Encyclopedia, and later chief horticultural contributor to the Cyclopedia Americana. In 1904, he was chosen Associate Editor of the American Agriculturist, and has served in that capacity during the past ten years.

Professor Kains is well-known by the leading horticulturists of the eastern states. He has taken an active part in the programs of many state meetings, and has also served as judge at many of the eastern fruit shows. He is especially familiar with the fruits of the temperate zone. During his connection with the American Agriculturist, he has served as editor of a large number of agricultural and horticultural books.

Professor Kains' ability as a teacher, speaker, investigator, and editor, together with his knowledge of eastern conditions and his acquaintance with eastern horticulturists, make him unusually well qualified to head the Department of Horticulture at The Pennsylvania State College.

## SELECT SEED CORN IN THE FIELD.

The selection of plants and animals for reproduction is an ancient art and one which is chiefly responsible for the vast improvement of present-day forms over those of earlier centuries.

The improvement of corn by selection is easy because the plants are large and their characteristics are plainly visible; because the variations are sufficiently marked and frequent to assist in the selection of individuals with desirable characteristics; and because of the large number of plants that can be propagated from the individual and the consequent rapidity of multiplication.

The items of cost entering into the production of an acre of corn are chiefly rent or interest on the value of the land, taxes, and the necessary cultural operations, including fertilizers and incidentals. These items are not affected by the quality of seed used. In a comparison of corn with other cereals, a high price per bushel for seed is not to be considered because so little seed is required per acre. Good seed produces larger yields than seed which has received no special attention when grown under identical conditions, and the value of such increase is of far greater importance than the difference in price of good and inferior seed.

**Selection of Seed.** Selection should be made in the field where both plants and ears can be seen. This should be done while the corn is standing and just as it approaches maturity. At this time selection can be made with reference to stage of maturity as well as desirable characteristics of both plants and ears. Seed ears should be selected from plants growing under normal conditions. Plants occupying more than the average amount of space, or those growing on soil much above the average fertility of the field, would produce ears larger than the average by virtue of their more favorable environment rather than from any inherent tendency of size or quality. On the other hand, exceptional ears growing under normal conditions are exceptional because of their inherent tendency to excel the average. When used for seed, such ears are more likely to produce good corn than ears equally as good because of more favorable environment.

Good plants should be of moderate height. Short nodes or joints are preferable to long ones for each node bears a leaf. The greater the leaf surface, the greater the power of the plant to manufacture the elements of air and soil into corn. The leaves are the most palatable, digestible and nutritious part of the forage. The plants should be free from smut, rust or any other fungous diseases.

The ears should be attached to the stalk at the convenient height of about four feet, by a shank of moderate length and thickness. If too long, the shank allows the ear to pull the stalk over; if too short, the ear is too erect and may be damaged at the tip by water entering the husks. The husks should be moderate in amount, and sufficiently long to cover the tip of the ear and to protect the kernels from insects, birds and damage by rain.

A good seed ear should be from 8 to 10 inches long (for medium-maturing varieties). The form should be cylindrical or slightly tapering from butt to tip. The tip and butt should be well filled with kernels, and the rows—16 to 20 in number—should be straight and continue well to the butt and tip with kernels of regular and uniform shape.

Kernels 5/8″ long, 3/8″ wide and 1/6″ thick are a good size. The tips should be strong and full indicating good vitality. The embryo or germ should be large and extend well up toward the crown. Large embryos produce vigorous plants and indicate high fat and protein content and consequenty high feeding value.

**Process of Selection.** The selection of seed corn is best made by providing bags with shoulder straps that can be carried over the shoulder as one walks through the field. By passing through the field and observing one or two rows, the choicest ears of good plants growing under normal conditions may be collected in the bags. When filled, the bags are emptied at the end of the rows, after which the corn is hauled to the place of storage. A further selection with refence to uniformity of type and desirable ear characteristics may be made at the place of storage and the poor ears rejected.

**Care of Seed.** After the seed is selected, it should be well cared for by storing in a dry and well-ventilated room and out of the reach of rats and mice. When thoroughly dried, corn will stand a very low temperature without injury, but if not well dried, a temperature not far below the freezing point will injure it, and destroy its vitality or germinating power, and make it worthless for seed.

Artificial heat may be used to dry the corn, if weather conditions are unfavorable for the process. Too much heat, however, is undesirable.

It pays to use good seed-corn. If you do not desire to select your own seed, you can well afford to pay your neighbor a good price for well-selected seed. There is a good opportunity for men, in every neighborhood where corn is grown, to produce seed-corn for local use at a good profit.

# THE EXTENSION BULLETIN

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A Pennsylvania Peach Orchard.

# PEACH GROWING IN PENNSYLVANIA

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# PEACH GROWING IN PENNSYLVANIA

R. H. BELL

Next to the production of apples, the growing of peaches is the most important fruit industry in Pennsylvania, although it has not been so extensively nor so intensively developed as market and natural conditions warrant. With favorable soil and climatic conditions, adequate means of transportation, and an abundance of near-by markets, there is no reason why the demand should not be fully supplied by home-grown fruit. Our smaller cities and towns offer especial opportunities to the man with a medium-sized orchard. The demand is for fruit of high quality, which is practically impossible in that shipped from distant points, but quite possible in fruit that can be ripened on the tree and sent directly to the consumer.

The industry is best developed at present in the southeastern part of the state where conditions of soil and climate are admirably adapted. There is also promise of increased production in Erie and adjoining counties where conditions are equally favorable. Diversified fruit growing has, however, long since gained a foothold in these sections, and their turning to peach growing is doubtless due more to personal inclination than to any peculiar adaptability of natural conditions. There is, in fact, abundant reason for believing that many other sections of the state would be equally favorable if proper attention were given to selection of varieties, soil, and site, and the various operations which are everywhere essential to success in fruit culture.

## FACTORS INVOLVED IN THE SELECTION OF THE ORCHARD SITE.

The character of the soil and the possibilities for air drainage are likely to be the most important factors to be considered in the selection of the orchard site, but the distance from market, and the character of the highway, particularly in the case of large plantings, are sufficiently important to influence the choice of location. The severity of the climate in many sections of the state is frequently regarded as a serious handicap, but it has been found that where proper methods are used this difficulty is largely overcome.

**Soils.** Although peaches are successfully grown on a variety of soils, the lighter (sandy or gravelly) types are usually preferred. A good potato soil, if properly located, is usually considered very satisfactory. Other factors, however, such as elevation and air drainage, more frequently limit success so far as natural conditions are concerned.

The character of subsoil is always of the utmost importance, since upon it largely depends the matter of drainage. Bed rock or an impervious hardpan near the surface should always be avoided. Loose rock, however, is not especially objectionable. In fact, some of the finest orchards are located on land so stony that plowing is quite difficult. At the same time, excessive drainage frequently exists where the subsoil is made up of coarse sand or gravel to a considerable depth. This can be determined by means of a spade, soil auger, or other tool which will enable one to inspect the soil to a depth of at least three feet. With proper elevation and air drainage, a sandy or gravelly-loam surface soil, eight to twelve inches in depth, of at least moderate fertility and containing a fair supply of organic matter, underlaid by a fine, sandy, clay-loam subsoil of equal depth, and this in turn underlaid by a somewhat heavier material, will come nearest the ideal type. Such a soil is easily handled, provides good drainage, warms up quickly, insures a firm steady growth of well-matured wood, and will produce fruit of high color and excellent flavor.

Many of our so-called foot-hill soils, especially those derived from sandstones, ironstones, and shales, if well drained with respect to both water and air, are quite satisfactory. Some of the glacial soils —particularly the gravel and sandy loams found in the northwestern, northern, and northeastern parts of the state—when properly located, can be used with excellent prospects of succcess. The heavier soils, such as those derived from limestone, although they may produce abundant wood growth, are not especially desirable, yet some very suitable soils are found on the border between the limestone and sandstone formations. It is not generally considered advisable to use land from which peach trees have just been removed without first devoting it to other crops for at least a year or more.

**Air Drainage.** Adequate air drainage is one of the very first essentials in choosing a site for a peach orchard. Elevation above the immediately surrounding country is usually, although not always, necessary. It is not sufficient, nor is it important, that the site be high above sea-level. Neither is it necessary that it be on the highest hill in the community. In fact, the latter is frequently undesirable because of exposure to winds and difficulty of access. Steep hillsides are not only not necessary, but may be undesirable for extensive plantings. Plateau-like areas or broad hilltops from which there is sufficient fall, either by general slope or one or more depressions to the valley or stream level, are ideal. Frequently a rise of 30 to 50 feet is sufficient, particularly near large bodies of water, but the local elevation must, as a rule, be greater in districts farther inland and as the general altitude increases. The larger rivers of the state, in some cases, appear to exert a protective influence, but this can not be assumed as a general condition and therefore requires local consideration.

**Climatic Difficulties.** The frequency of winter injury has doubtless discouraged many from entering the business of peach growing. We are coming to believe, however, that damage by frost is due to causes which can be largely remedied. The whole of Pennsylvania is in fact, well south of the northern limit at which the peach is successfully grown. Improper drainage of air and water, lack of nourishment, immature wood growth, insect injury, and overbearing, are responsible for some of the conditions which cause trees and crops to succumb to low temperatures.

**Distance from Market.** It is difficult to make specific statements in regard to the maximum distance from market or shipping point at which it is safe to locate. With good roads, and where the size of the orchard or farm operations in general would justify the use of a motor truck, from ten to twelve miles might be a safe distance. For average Pennsylvania conditions, however, this distance would doubtless be too great. Many of our rural communities are practically without a supply of peaches and they often present opportunities to the small grower which are frequently unrecognized or underestimated. In any case, however, a good road to market is especially desirable, since careful handling in marketing the crop is one of the important requirements.

**Exposure.** The direction of the slope of orchard land has long been a debatable question, but, except for a few isolated cases, the matter is of little or no importance to the growers of Pennsylvania. The few exceptions are likely to be found in localities that are especially subject to frosts. The latter, however, should be avoided in any case especially with commercial undertakings. Special effort to avoid frosty areas by actual study of the local conditions, with especial regard to air drainage rather than reliance on any particular slope for protection, is the wisest plan to follow in establishing an orchard of any kind or size.

## ORDERING AND CARING FOR TREES UNTIL PLANTING.

Having decided on the varieties, the grower should submit his list to several reliable nurserymen, giving preference to near-by firms, other conditions being equal. For large plantings, it may pay the grower to visit the nursery and personally select his trees. It is always best to have orders placed early. The best arrangement for spring planting is to order in the fall and to heel the trees in over winter near the place where they are to be planted. This should be done before freezing weather and while the ground is in good workable condition. Plow a deep double furrow, preferably running east and west. Unpack the trees as soon as received and arrange them along the furrow with tops leaning to the south. After each row is so arranged fine soil should be placed snugly about the roots, care being taken that no open spaces remain. Additional rows of trees are then placed in like manner until the space is filled. When finished, they should be considerably deeper in soil than they stood in the nursery. The roots may be pruned ready for planting, as described later, before heeling in. Where the nurseryman is provided with adequate storage, this holding of stock over winter may be intrusted to him, but unless the grower is sure of this the "heeling in" method is generally safer.

If trees are not received until spring they should be unpacked immediately; if time permits, the roots may be pruned and made ready for planting. If the trees are to be planted within a few days, they may be held with the roots in water. Otherwise they should be heeled in as described above. It is safe to say that the majority of failures in getting trees started properly are caused by the drying out of the stock. This may be due to faulty storage or handling on the part of the nurseryman, to long or delayed shipments, or to failure on the part of the grower to properly care for the trees after they are received.

**Grades of Trees.** Peach trees are now generally graded on the basis of height, although the diameter or "caliper" of the stem is sometimes given. Size 4 to 5 feet and about ⅝ inch "caliper" is most satisfactory. Much larger trees are sold, but they are heavier to handle, usually cost more, and have not shown any advantage over the medium sizes. It is not advisable to use a very small size because of the likelihood of constitutional weakness. In any case, the trees should not be older than one year from the bud, and should be in a perfectly dormant condition, yet full of life as indicated by brightly-colored bark and freedom from insects, disease, shrivelling, and discoloration. They should show a good union of bud and stock, a well-branched root system, which is free from insect and fungous infections, and reasonably free from breakage. The parts above ground should be stocky and have at least several limbs well distributed along the stem. "June buds" are not generally desirable.

## GROWING TREES AT HOME.

The likelihood of getting varieties which are untrue to names, and the opportunity for propagating from superior individuals, as well as the desire to avoid certain injurious diseases, has led some growers to produce their own trees. Seeds of any variety are buried during the winter under a few inches of moist sand or soil. In the early spring these are planted in rows three or four feet apart and six to eight inches in the row. Seeds may be planted in the nursery row in the fall and thus the spring shift will be avoided. When shifted in the spring, the seeds should show either short sprouts or be burst open so as to allow the sprout to come forth. These small trees or seedlings are cultivated until August at which time they should be budded, using buds from the most desirable trees of the varieties wanted. Budding should be done as near the ground as possible, and as soon as they have "taken" (grown fast) the tying material should be removed, usually by cutting on the side opposite the bud. These buds will not start into growth until the following spring at which time the top of the seedling is cut off immediately above the bud. Cultivation should be given during the second season, at the close of which the trees will be ready for planting and will constitute what is commercially known as one-year-old stock.

In general, however, the average grower is likely to get better satisfaction by securing trees from reliable nurserymen, who, with their skilled workmen and more adequate facilities for handling the work, should be able to produce superior stock.

## SOIL PREPARATION AND PLANTING.

For Pennsylvania, fall planting is seldom advisable. Spring planting should begin as soon as the ground is in workable condition. Fall plowing is preferable in order that the soil may be well settled when planting time comes. The preparation of the soil in any case should be equivalent to that for general farm crops. Soils which have been farmed regularly for several seasons are usually preferable. A good heavy clover or clover and timothy sod is excellent if put in proper condition before planting. When time will not permit the preparation of the entire area, strips five to six feet wide and coinciding with the tree rows may be prepared, the trees set, and the remaining area plowed later. The trouble with this system is that frequently the plowing is not finished and cultivation and cover-crops are neglected.

**Planting Distance.** The character of the soil and system of pruning to be followed will have some influence on the planting distance. The heavier soils usually produce a larger growth and therefore require a little more space than the lighter types. Also with severe annual heading back less space will be required. In general, 20 feet by 20 feet or 18 feet by 20 feet on the square or hexagonal plan, is most satisfactory. Twenty-five feet is not too much space between rows on steep hillsides. If set on the square plan, the dimensions of 20 feet by 20 feet will require 108 trees, and those of 18 feet by 20 feet, 121 trees per acre. Where the triangular or hexagonal method is used, about 15 per cent. more trees can be set on a given area at the same distance between trees. Where the peach is used as a filler in the apple orchard, the distances will of course depend on the spacing of the latter, but it should rarely be less than that above indicated.

**Laying Out the Orchard.** After the soil is prepared, a simple method of locating the rows is by the use of a plow with a good steady team and careful driver. A double furrow is thrown out for each row of trees. In drawing the second furrow, the irregularities in the first can be taken out. For the proper spacing of trees on the row, use a light pole of a length equal to the desired distance between trees. A long wire to which bits of finer wire are firmly secured, at intervals corresponding to the distance between trees, may be used instead of the pole if desired. This wire, preferably No. 12, or thereabouts, should be long enough to reach the entire length of the field and is best handled on a reel of some sort.

In laying out irregular hillside orchards, it is best that the rows follow the contour lines; for this purpose, the plow is the most common means of doing the work. In this case, the wire referred to would be of no service.

Where greater accuracy is desired, the plow may be dispensed with, and two border rows of trees, accurately set on adjoining sides of the field and at right angles to each other, used as base lines. If the field does not have two sides at right angles, set one border row, and beginning with the corner tree—or any tree for that matter—set another full row exactly at right angles to the first, using shovels to make the holes. Two light poles—ordinary bamboo is suitable—of a length equal to the distance between trees, are placed with one end in contact with tree number two of each of the rows thus formed; the other two ends are brought together, and the position of tree number two of the second row is thus secured. Tree number three of the second row is similarly located by using the tree just located and tree number three of the border row as a base. Continuing in this manner, the entire area may be speedily and accurately set. If desired, this method may be used for staking off an area previous to planting, and with slight modification it may also be employed on irregular areas and those with rows following the contour lines. Where peaches are used as fillers in the apple orchard, it is best to set the apple trees first. The position of the peach trees can readily be determined by lining up on the apple rows, but it is important that the latter be accurately placed.

If it is desired to use the triangular plan of setting the trees, the arrangement of using two poles, as above described, will apply except that only a single border row is required as a base line. Tree number one in the second row is located by placing one end of each pole in contact with trees one and two of the first row and bringing the other two ends together. In like manner, tree two of the second row is located by using trees two and three of the first row and so on for each succeeding tree and row. The poles in this case must, of course, be equal in length.

**Setting the Trees.** The protection of the roots from drying out is very necessary to success in planting trees. This is probably best accomplished by using some form of wide barrel containing a little water and mounted on an ordinary stone-boat or plank sled. The trees can be set in this barrel as they are taken from temporary storage, hauled to the field and transferred direct to the soil. Where the plow is used for marking out the rows, a small amount of shoveling as the trees are set will be necessary to prevent the roots from being cramped. The trees should be set slightly deeper than they stood in the nursery row. Fine moist soil should be placed about the roots and thoroughly firmed by tramping, with the exception of an inch or two on top which is best thrown in loosely. If the trees are exposed to strong winds, they may be leaned slightly in the direction of such winds. Under no condition should they be set when the ground is too wet for general farm work.

**Pruning at Planting Time.** The roots should be cut back to about six inches on a side, and all those which are bruised or broken removed or pruned back to sound wood before planting. The tops are best pruned to whips or short stubs. The latter practice appears to be gaining favor for the reason that the strongest buds are usually produced near the bases of the limbs. Three main limbs are sufficient for the mature tree, but it is well to have one or two more at first, and thus provide for losses which usually occur. The lowest of these limbs is best located from twelve to fifteen inches above the ground and the uppermost ten to fifteen inches higher. This will allow sufficient trunk space between the main limbs and thus avoid bad forks which are always a source of weakness. If headed lower than this, cultivation and "worming" will be more troublesome, and in case limbs are thrown off very close to the ground a weakened trunk may result. These main limbs should also be well distributed about the trunk so that the tree will have proper balance. If the trees are pruned to whips at planting, which means the cutting off of all limbs close up to the main stem, the above suggestions as to formation of the head will also hold.

## CULTIVATION, COVER-CROPS AND INTER-CROPS.

Clean cultivation combined with some form of cover-crop is generally considered to be best suited to the peach. Such cultivation should begin in early spring and consist in first plowing or disking the ground to a moderate depth followed by frequent cultivations with some form of harrow. If this work is done with a disk harrow, cultivation should begin before weeds and other growth get too much of a start. Plowing offers more leeway in this regard, but may cause more injury to roots. Special tools are now on the market which are well adapted to this work. One which can be extended so as to reach close to the tree, thus obviating the necessity of crowding the team under the limbs, is most satisfactory. The ordinary grape hoe, as used in vineyards, is sometimes used with success. The main idea, however, is to maintain a good dust or soil mulch for the purpose of conserving moisture, keeping down weeds, and supplying air for bacterial and other soil activities. Some handwork is usually necessary about the trees to prevent weeds from robbing the roots of moisture. The system of soil mulch recently found satisfactory with the apple has not been given a thorough trial with the peach, although there is no doubt that it will be found an improvement over ordinary sod even with this fruit.

**Cover-Crops.** Since the peach is a heavy feeder and a strong consumer of moisture, it is very important to maintain an adequate supply of organic matter in the soil. This is usually best accomplished by sowing some form of cover-crop at the last cultivation, which should generally be given about July 15 to August 1. If rye is used, however, from September 1 to 15 is sufficiently early, although, as a rule, cultivation except that incident to the sowing of this crop, should not continue later than August 1. When nitrogen is needed, a legume should be used, otherwise a non-legume is preferable and usually cheaper. Rye is frequently sown with vetch. It has been our experience that vetch will stand the winter much better when sown with rye, than when sown alone. A list of crops commonly used for this purpose, together with the rate of seeding per acre, is given below:

| Legumes | Rate |
|---|---|
| Red clover | 15 lb. |
| Crimson clover | 20 lb. |
| Sweet clover | 20 to 30 lb. |
| Vetch (hairy) | 40 to 60 lb. |
| Soy beans | 1¼ bushel. |
| Cow peas | 1¼ bushel. |
| Rye and | 1 bushel. |
| Vetch | ½ bushel. |

| Non-legumes | Rate |
|---|---|
| Rye | 2 bushel. |
| Millet | ½ bushel. |
| Buckwheat | 1 bushel. |
| Oats | 3 bushel. |
| Cowhorn turnips | 4 to 6 lb. |
| Rape | 8 lb. |

**Inter-Crops.** No special injury should result from the growing of certain plants as inter-crops in the peach orchard during the first two

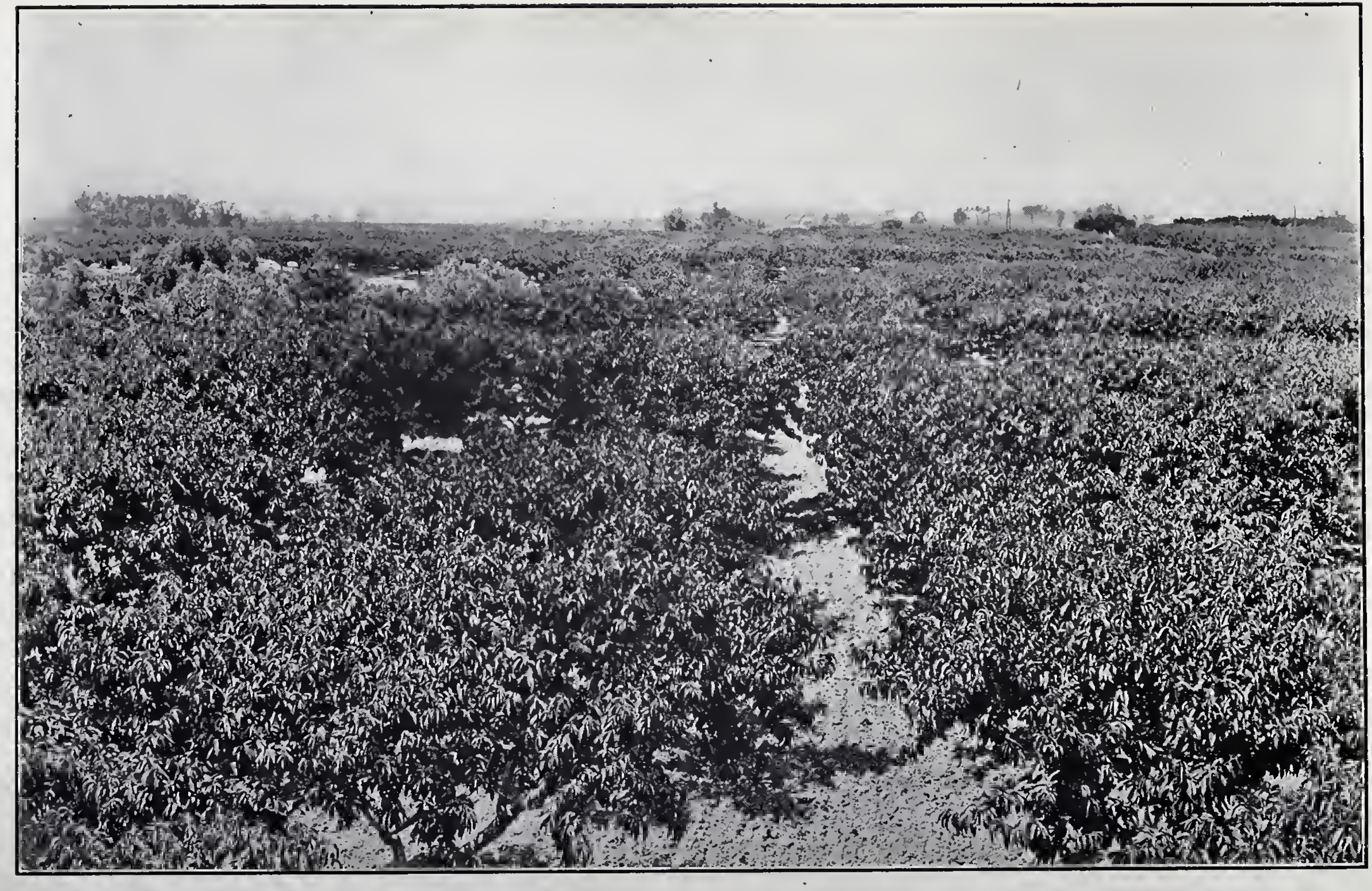

Fig. 1—This orchard shows every indication of proper care. Note the condition of tillage and the healthy and shapely appearance of the trees.

years, provided certain requirements are met. These are as follows: (1) Only early-maturing, cultivated crops should be used; (2) grain crops which must mature before harvesting are unsatisfactory; (3) the increased draft on the supply of plant-food must be met by increased applications of manure and fertilizers; (4) whatever the inter-crop, it should permit of the sowing of some form of cover-crop; (5) ample space should be left between the inter-crop and tree rows so that the root areas will not seriously overlap. Early potatoes, peas, beans, sweet corn, and possibly cabbage, meet the above requirements very well.

## FERTILIZATION.

As a general rule, little fertilization is necessary during the first few years. Exceptions to this may occur as in the case of poor soils where a moderate application of barnyard manure about the trees is probably the best treatment that can be given. Where manure is not available, a few ounces of nitrate of soda, or finely ground bone, or dried blood—preferably one of the latter two may be used, care being taken not to apply it too close to the trees or to use it in too large quantities as actual injury may result. The need of fertilization will be indicated by pale, sickly foliage and insufficient growth. An average growth for the first few years of 24 to 36 inches in a season is quite satisfactory. In fact, considerably more growth than this is frequently made without fertilization of any kind.

The greatest need of fertilization will occur after the trees are in bearing, but there is great difference of opinion as to the relative value of fertilization as a whole and of the essential elements taken separately. This apparent discrepancy is doubtless largely due to the variety of conditions under which different men have studied the problem and emphasizes the importance of thorough study of local conditions affecting this phase of the business. There is little doubt that the shortness of the average life of the peach, and the frequency and severity of winter and insect injury, are largely attributable to the lack of readily available plant-food.

In general, when a complete fertilizer is needed, a 3-8-6 mixture will be found satisfactory for the average Pennsylvania orchard in bearing. The quantities per acre may vary from 300 to 1000 pounds, depending upon the age of the trees, the soil, and size of the crop. Just after the fruit is set is usually the best time to apply the fertilizer, as the quantity can then be varied to correspond with the size of the crop. The above formula is approximately secured by combining 200 pounds of nitrate of soda, 300 pounds of dried blood, 1100 pounds of acid phosphate, and 240 pounds of muriate of potash. Other sources of the essential elements are frequently recommended and may be equally good. Where leguminous cover-crops are used, the nitrogen carriers may be largely or wholly omitted from the commercial fertilizers, particularly on the heavier soils.

It is well to bear in mind that occasionally tree fruits do not respond to fertilization sufficiently to justify their use, and for this reason careful study is necessary, especially where considerable outlay is contemplated. Also, in any scheme of fertilization, tree growth should not be unduly stimulated and the season prolonged so that the wood will not be properly ripened upon the approach of winter.

## PRUNING.

If the trees are pruned at planting time, as already advised, the growth may be allowed to continue uninterrupted for the first season, although some growers prefer going over the orchard several times during this period and rubbing off all buds except those needed to provide for the four or five framework limbs.

**The Second Season's Pruning.** If the growth has not been directed during the first season as above described, all limbs except those needed for the framework should be taken off close to the trunk before the second season's growth begins. These framework limbs should then be pruned back to the extent of one-third to one-half of the previous season's growth, and each should be allowed to retain two or three side branches so located as to give proper balance to the head. If these framework limbs are selected during the first growing season, heading back is all the attention they will need at the beginning of the second season. Most growers prefer the vase-formed tree; where that is desired, care is necessary to prevent the development of a central leader.

**Pruning During the Third and Subsequent Seasons.** At the beginning of the third season, the shaping of the framework should be continued. If it is necessary to lessen the number of main limbs, the one or two least desirable, or those which will interfere least with the general shape may be taken out. The side branches should then be treated, with respect to heading back and reservation of side branches, in the same manner as already advised for the main-stem branches. More or less rank, sprouty growth may have developed upon the main branches, and it should be largely pruned off.

The third season's pruning should largely finish the shaping of the framework. During the remaining seasons, pruning will consist largely in the removal of superfluous growth; in cutting out all dead and weakened wood; in heading back so as to induce new growth, keep the tree in balance, and regulate the amount of fruit. The latter is accomplished by cutting back more heavily when prospects are favorable for a heavy crop and vice versa.

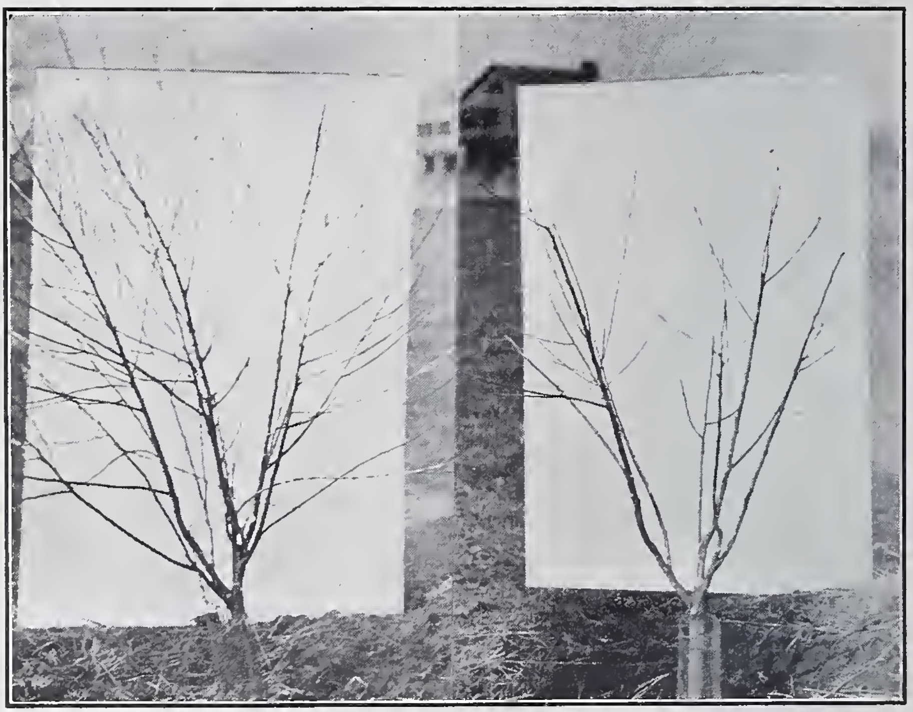

Fig. 2—Two-year-old tree before and after pruning.

**Summer Pruning.** The chief advantages claimed for summer pruning are that it induces fruiting; relieves the tree from unnecessary wood production; and gives further opportunity to direct more exactly the formation of the head. As a general rule, it should be confined to the cutting out of crosses and excess growth, leaving the main cutting back until spring, since the amount of the latter must be based partly on the setting of fruit buds and the extent of winter injury to tip wood.

**Reclaiming Old Trees.** Old trees which still possess a fair amount of vitality, but not sufficient to produce satisfactory crops, and those which have been allowed to grow to an unmanageable size, are frequently benefited by renewal pruning or "dehorning." This consists in a very severe cutting back of the top as shown in Figures 3 and 4. It is always best to have some side branches remain near the points where cuts are made, as is shown in Figure 3. An abundance of new growth will be thrown out along these stubs and this should be thinned out to the desired number of limbs and properly headed back before the second season's growth begins.

## WINTER INJURY.

Winter injury may be of three different kinds, viz.: killing of buds, killing of terminal branches, and killing of the entire tree. In general, the fruit buds of the peach cannot withstand temperatures lower than 15 to 20 degrees below zero, Fahrenheit. Such temperatures also frequently kill considerable tip wood, and sometimes the whole tree, although the killing of both may occur under milder conditions. Winter injury of the entire tree is usually characterized by a weekly growth in the early spring, followed by rather sudden to gradual decline, the general effect of which is frequently similar to that produced by borers. Sometimes a moderate heading back will help the tree to recover. Depressions about the base of the trunk where water can settle and freeze during the winter should be kept filled up as they are thought to be conducive to this trouble. It is generally believed, also that winter injury in general is very dependent on the vitality of the tree and its condition of growth. A reasonably vigorous growth of well-ripened wood is regarded as one of the surest means of protection against it.

## INSECTS AND DISEASES.

The peach is not seriously affected by a large number of insects and diseases, but a few of those from which it does suffer are very destructive and difficult to handle. Spraying and general combative measures are, therefore, very necessary to success. Practically the whole matter of spraying makes use of but four standard materials, viz.: concentrated lime-sulphur, self-boiled lime-sulphur, arsenate of lead, and to some extent tobacco extracts, such as "Black-Leaf 40." The concentrated lime-sulphur is mainly used in winter against scale insects,

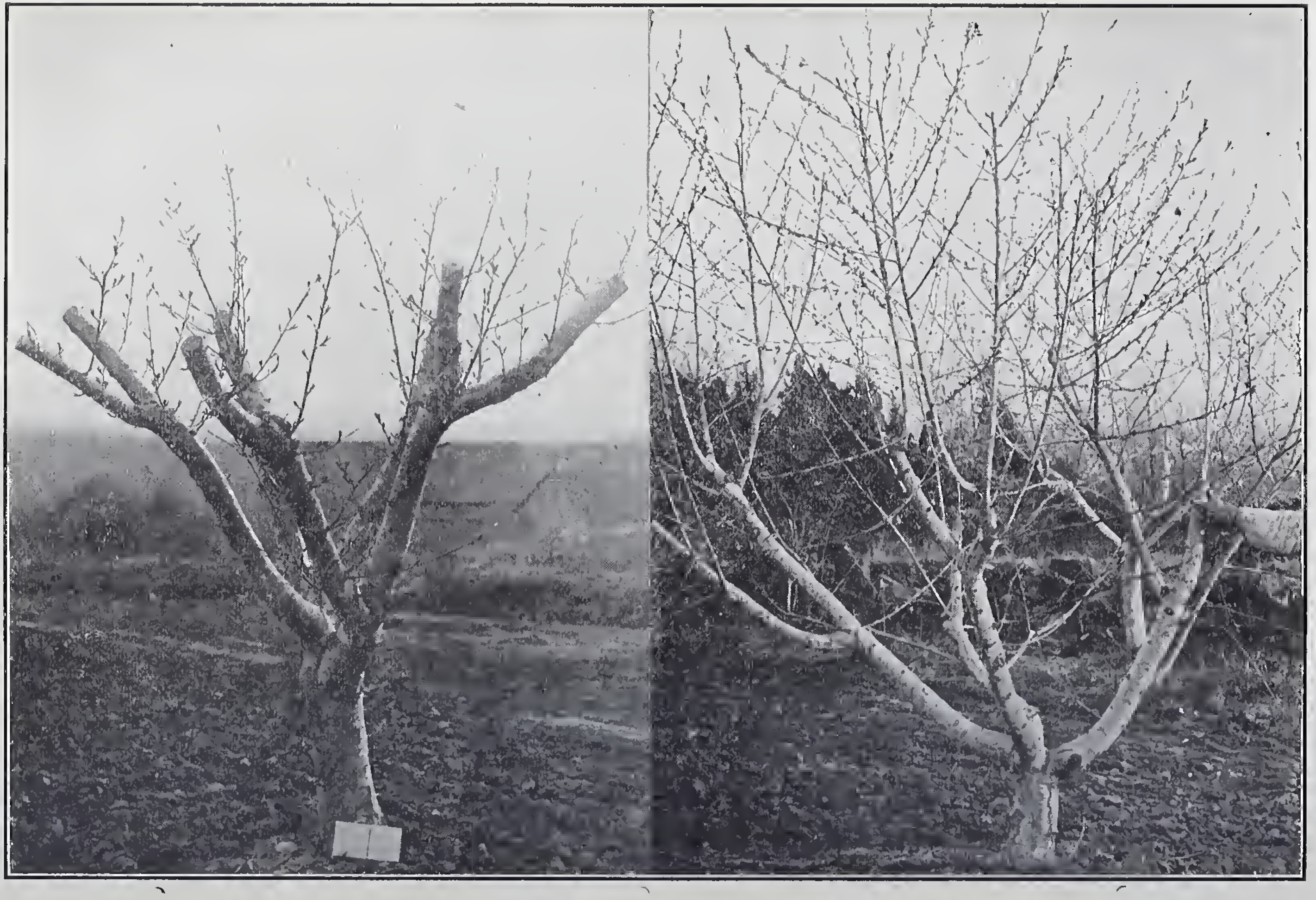

Fig. 3—The proper method of renewal pruning on the left, and a similar tree, one year later, with the new growth properly thinned, on the right.

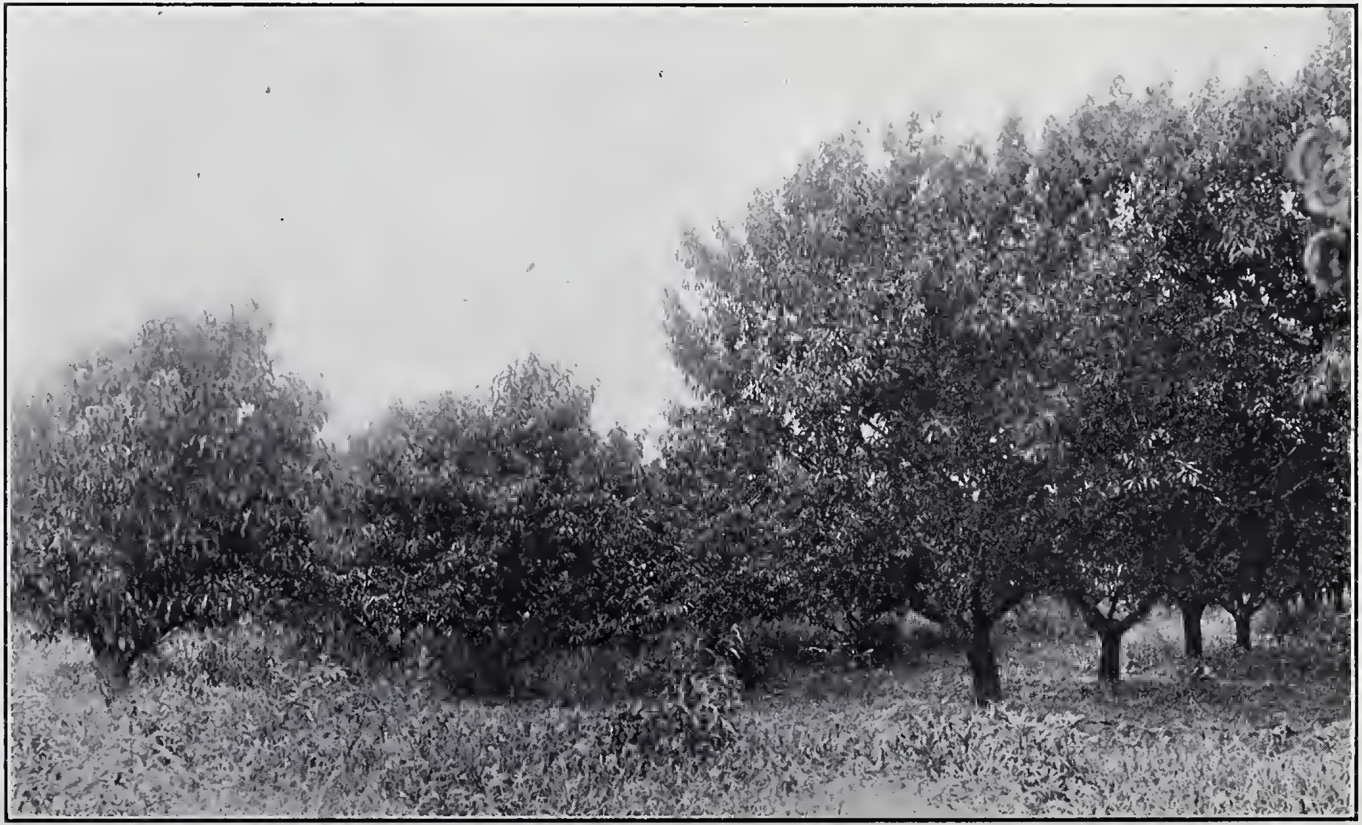

Fig. 4—The trees on the right are about 18 years old, and because of insufficient pruning are practically beyond control. Those on the left are the same age but were headed back one year previous to the taking of this photograph.

although it may frequently be substituted for the last spray of self-boiled lime-sulphur and thus a certain amount of discoloration of the fruit which generally results from the use of the latter, be avoided. This should be tried very carefully on a small scale before being used generally*. A certain amount of burning of foliage is likely to result from the use of arsenate of lead, particularly when it is combined with lime-sulphur. This is largely prevented by the use of some corrective agent such as lime or lead acetate. The tri-plumbic or neutral lead arsenate which is now on the market is probably safer than the ordinary grades, but should be used in slightly larger quantities.

## GENERAL SPRAY TREATMENT FOR THE PEACH.

The following general outlines of treatment will guard against the most common troubles for which spraying is used. Thoroughness and strict attention to the time of application are very important:—**

(1) **Lime-sulphur (sp. gr. 1.03) in winter or preferably just before buds open, for scale and leaf curl.** If aphids are present, add "Black Leaf 40" (1 pt. to 100 gal.***), and apply when blossoms show a little pink. If terrapin scale or peach lacanium are severe, use a 20 per cent. solution of kerosene emulsion or its equivalent in a miscible oil, while trees are dormant.

(2) **Two pounds of arsenate of lead paste,**** and two pounds of freshly slaked lime or five ounces lead acetate, to 50 gallons of water as calyces or "shucks" are being shed.** This is primarily for the curculio.

(3) **Self-boiled lime-suphur (8-8-50) plus two pounds of arsenate of lead paste****to 50 gallons of water, three to four weeks after blossoms fall.** For brown rot, scab and curculio.

(4) Same as No. 3, minus the aresenate of lead, three to four weeks before the fruit ripens. For scab and brown rot. Concentrated lime-sulphur might be used at this time instead of the self-boiled.

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*The strength in this case should not be greater than 1.003 sp. gr. Thoroughness of application is important but drenching should be avoided. For complete details of preparation and dilution, see Pennsylvania Experiment Station Bulletin No. 115.

**See Bulletin No. 110 of the Pennsylvania Experiment Station.

***This strength may be safely used at any season of the year, but if used alone about 2 pounds of soap should be added to each 50 gallons of dilute spray.

****The tri-plumbic as above recommended may be used here, in which case the lime or acetate is unnecessary. If the powdered arsenate is used, only one-half these quantities should be used.

(5) With late varieties during wet seasons No. 4 should be repeated midway between 3 and 4.

It is also important to remember that the control of brown rot which has come to be troublesome is largely dependent on the control of the curculio.

**Borers.** There are two of these, one which attacks the base of the trunk and the other the limbs and smaller branches. The former is the more severe and will attack healthy trees, while the latter usually infests weakened limbs of trees. Exudations of borings mixed with a gummy secretion near the base of the trunk, combined with sickly growth in severe cases, distinguishes the former. The latter is commonly spoken of as the twig borer, and is distinguished by

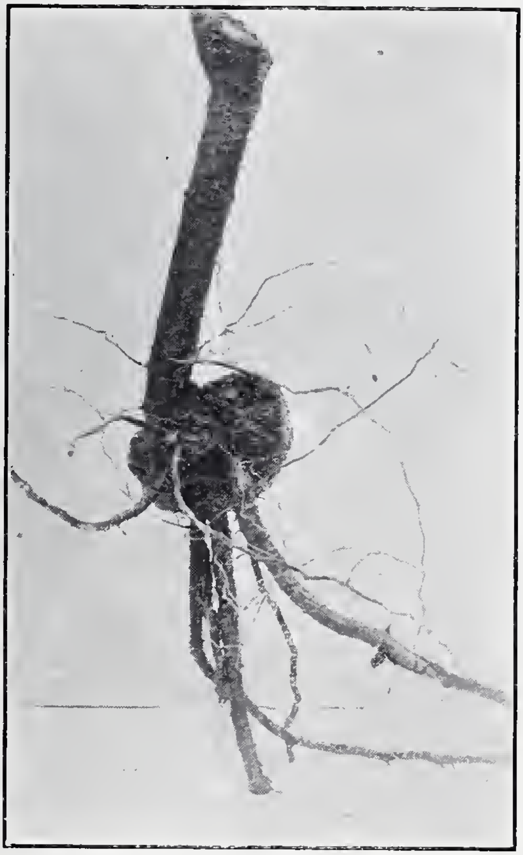

**Fig. 5—Crown gall of the peach—a bacterial disease frequently found infesting nursery stock. Trees so affected should be discarded.**

gummy exudations on the main limbs and branches. Treatment for the latter consists in destroying infested or weakened trees or parts of trees, and in maintaining vigorous growth. Mounding with earth and "worming" (removal with knife and wire) in spring or fall, or both, is the best method so far discovered for the destruction of the borer infesting the trunk. The mound of earth (6 to 8 inches high) should be in place during the egg-laying period, which extends from about June to October. Various coatings have been recommended but most of them are of little value and many are positively injurious. Painting the trunk and crown with lime-sulphur sediment or sludge is helpful and perfectly safe. A fairly continuous covering should be maintained.

**Yellows.** Nothing is known concerning the exact cause of this disease except that it is apparently transferable from one tree to another. In fact it is unsafe to take buds from apparently healthy parts of affected trees for propagating purposes. The disease is characterized by a yellowing of the foliage, combined with clusters of vertical willowy shoots on the trunk and main limbs, and premature ripening of red-spotted fruit. The latter is usually the first reliable evidence, and should always be present before applying the one and only remedy. The removal of the tree as soon as the disease is detected is the only reliable treatment. Sterilization of tools used in pruning and "worming;" using stock only of nurserymen who understand and use means of eliminating the disease; avoiding low and wet situations; and the maintenance of vigorous but not abnormal growth, will help to hold the disease in check. So far no important injury is known to result from replacing the diseased trees by healthy ones.

**Root Aphids.** Certain species of the aphid frequently infest the root of the peach, and do considerable injury by sucking the juices from the tender roots. Knotty enlargements are usually produced. These are frequently found on nursery stock. It is a mistake to plant such trees but when that is unavoidable they should first be dipped in a strong solution of tobacco or a 10 per cent. kerosene emulsion. Trees already established may be benefited by removing the soil from the roots to a depth of several inches and to a distance of two or three feet from the trunk. This area should be treated with several gallons of a 10 per cent. solution of kerosene emulsion, or a liberal quantity of tobacco stems or dust should be applied and the soil replaced. The emulsion, however, is likely to be the more effective.

## THINNING THE FRUIT.

Frequently, the peach sets many more fruits than it can properly mature. The production of large numbers of seeds or pits is a severe tax on the vitality of the tree and prevents the securing of desirable size. The advantages of thinning are that fruit of higher quality is produced; the tree is better able to produce fruit buds for the next season while maturing the current crop; and the actual volume of fruit is usually not materially reduced.

Thinning may be accomplished in two ways, viz.: by pruning more severely when there is an abundance of fruit buds and by actual removal of fruit. The former is done at the regular spring pruning and the latter after the customary "June drop." The longer this is delayed the heavier will be the unnecessary strain on the tree. In general, the fruits should not on the average be closer together than 4 to 6 inches on the limb. All defective and injured fruit should, of course, be removed first, and it is well to prevent fruits coming in contact with each other so far as possible.

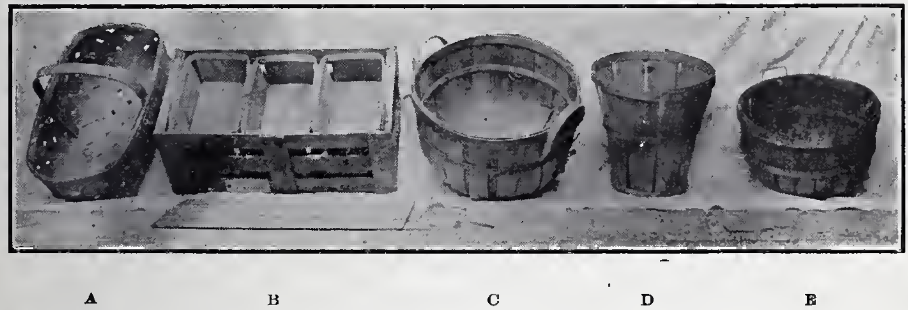

**Fig. 6—Packages Commonly Used for Peaches. (A) Half Bushel. (B) Georgia Six-Basket Carrier. (C) Round Bushel Basket. (D) Half Bushel Hamper. (E) Half Bushel Round Basket.**

## HARVESTING AND MARKETING.

The proper time for picking will depend on the length of time required for the fruit to reach market. If disposed of locally, it should be allowed to ripen on the tree. This means that the color should be fully developed and that a few specimens should be commencing to soften slightly at the apex. For more distant shipments, a condition sometimes referred to as "hard ripe" is desired. This means that the color is well developed but very few if any of the fruits show signs of mellowness. For best results, two or more pickings are frequently necessary, only those which come up to this standard being selected at each picking.

In all cases, the greatest care should be taken to avoid the bruising and breaking of the skin, since the keeping qualities, particularly where brown rot is troublesome, are in this way much impaired. Some form of padded packing table is necessary where large quantities are to be sorted and graded. Some form of spring wagon should also be used in hauling fruit from orchard to packing shed and to market.

Various styles of packages are used for marketing the peach, several of which are shown on page 21. A neat package is of much importance, particularly on the larger markets, although success in packing and selling is only assured when the fruit itself measures up to the standard it is supposed to represent. Grading is essential and should be based on color and general soundness as well as size. Some growers who are using a neat tissue paper as a wrapping for the fancy grades consider it an advantage. The mechanical grader is coming into somewhat general use in certain peach districts. A prominent Ohio grower claims that greater speed and accuracy may be attained by its use than by the most expert hand grading.

## VARIETIES.

Varieties vary considerably in their ability to withstand severe climatic conditions, and in their adaptability to the various soil and marketing conditions. These are points which the grower should carefully consider. He should give particular attention to the behavior of varieties in his home community or under similar conditions elsewhere. Six or eight varieties well distributed through the season are sufficient for commercial planting but it is often desirable to have a greater assortment in the home orchard. These may be selected from the following varieties: Mayflower, Greensboro, Arp Beauty, St. John, Carman, Miss Lola, Hiley, Champion, Belle, Ede, Elberta, Frances, Crosby, Fox, Smock, Iron Mountain, Stevens and Salway. This list provides a succession from early July until October, and is arranged in approximate order of ripening. It is not usually advisable to plant heavily of early varieties because of the competition of better varieties from the South.

# VARIETIES OF PEACHES FOR PENNSYLVANIA.

(Named in approximate order of ripening)

| Variety | Adhesion to stone | Size | Bearing Qualities | Color | | Quality | Shape | Vigor |
|---|---|---|---|---|---|---|---|---|
| | | | | Flesh | Skin | | | |
| Mayflower | cl. | m-l. | g.l. | w. | r. | g. | o. | g.1 |
| Victor | s. cl. | s. | g. | w. | r. | g. | rd. | g. |
| Fitzgerald † | f. | m. | g.l. | r.y. | r. & y. | fr. | o. | g.1 |
| Greensboro*† | s. cl. | l. | g. | w. | r. | g. | rd. | v.g. |
| Arp Beauty | f. | l. | g.l. | y. | r. & y. | g.1 | rd. | g.1 |
| St. John 2 | f. | l. | g. | y. | r. & y. | v.g. | o. | g. |
| Bishop | f. | l. | g.l. | w. | r. & w. | g. | rd. | g.1 |
| Waddell † | f. | m. | v.g. | w. | r. & w. | fr. | o.b. | fr. |
| Lewis † | f. | m. | g.-v.g. | y.w. | r. & w. | g-v.g. | rd. | v.g. |
| Connet*† | s. cl. | l. | g.-v.g. | w. | r. & w. | g-v.g. | obl. | g.1 |
| Carman**† | s. cl. | l. | g. | w. | r. & w. | g. | rd. | v.g. |
| Miss Lola † | f. | m-l. | g.l. | w. | r. & w. | g.1 | rd. | g.1 |
| Hiley*† | f. | l. | fr. | c.w. | r. & w. | g. | rd. | g. |
| Mt. Rose 2 | f. | m. | g. | w. | r. & w. | v.g.-b. | rd. | g. |
| Champion**† | s. cl. | l. | g. | w. | r. & w. | v.g.-b. | rd. | v.g. |
| Oldmixon Free * | f. | m. | g. | c.w. | r. & w. | v.g.-b. | o. | g. |
| Early Crawford 2 | f. | l. | fr. | y. | r. & y. | v.g.-b. | rd.o. | g. |
| Niagara * | f. | l. | fr. | y. | r. & y. | g-v.g. | o. | g. |
| Reeves 2 | f. | l. | p.fr. | y. | r. & y. | v.g.-b. | o. | g. |
| Ray * | f. | m. | v.g. | w. | r. & w. | v.g. | rd. | v.g. |
| Belle**† | f. | m. | v.g. | w. | r. & w. | v.g. | rd. | g. |
| Engle (Mammoth) | f. | l.-v.l. | g. | y. | r. & y. | g-v.g. | rd. | g. |

## VARIETIES OF PEACHES FOR PENNSYLVANIA—Continued.

(Name in approximate order of ripening)

| Variety | Adhesion to stone | Size | Bearing Qualities | Color | | Quality | Shape | Vigor |
|---|---|---|---|---|---|---|---|---|
| | | | | Flesh | Skin | | | |
| Ede**† | f. | m. | v.g. | y. | r. & y. | v.g. | rd. | g. |
| Bokhara † | f. | | g. | y. | r. & y. | fr. | | |
| Elberta ** | f. | v.l. | v.g. | y. | r. & y. | fr.-g. | o. | v.g. |
| J. H. Hale | f. | v.l. | g.1. | y. | r. & y. | g. | rd. | g.1 |
| Frances † | f. | v.l. | g.1. | y. | r. & y. | g.1 | rd. | g.1 |
| Chairs * | f. | m-l. | med. | y. | r. & y. | fr. | rd. | v.g. |
| Crosby † | s. cl. | m.-s. | v.g. | y. | r. & y. | v.g. | rd. | g. |
| Late Crawford* | f. | l. | med. | y. | r. & y. | g.-v.g. | rd. | g. |
| Stump * | f. | m. | v.g. | w. | r. & w. | med. | rd. | g. |
| Fox * | f. | m. | med.-g. | w. | r. & w. | med. | rd. | g. |
| Matthews | f. | v.l. | med. | y. | r. & y. | g. | rd. | g.1 |
| Geary * | f. | l. | g. | y. | r. & y. | g. | o. | g. |
| McCollister * | f. | l. | g. | y. | y. | g. | o. | g. |
| Smock ** | f. | l. | g. | y. | y. | g. | o. | g. |
| Iron Mountain † | s. cl. | l. | g. | gr.w. | y.gr. | med. | o. | g. |
| Stevens * | f. | m. | m.g. | w. | c.w. | g. | rd.-o. | g. |
| Salway ** | f. | m-l. | g. | y. | y. | g. | o. | g. |
| Krummel | f. | l. | g.1. | y. | r. & y. | g.1 | o. | g.1 |

**Explanation of Abbreviations.**

f. free stone. cl. cling. s. cl. semicling. s. small. m. medium. l. large. v. very. w. white. y. yellow. gr. green. r. red. c. creamy. 1. So reported. g. good. rd. round. fr. fair. o. oval. ob. oblong. obl. oblate. b. best. *Of limited commercial value. **Of full commercial value. † Especially hardy in bud. 2 Very good for home use.

# THE EXTENSION BULLETIN

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Vol. I AUGUST, 1914 No. 11

### COMMENCEMENT

One of the most successful Commencements in the history of the institution took place in June. The graduating class numbered 328. Of this number 126 were graduated in agricultural courses as follows: Animal Husbandry, 22; Agricultural Chemistry, 20; Agronomy, 22; Botany, 2; Dairy Husbandry, 8; Forestry, 23; Horticulture, 16; Landscape Gardening, 13.

At the close of the College year seventy-five per cent of the students in the courses had completed definite arrangements for entrance into the line of work along which they had been trained. A number of others were considering positions which had been offered to them or had taken Civil Service examinations for a government position but were not definitely located.

Sixty-four men completed the two years' course in agriculture and appropriate exercises were held the week prior to the regular Commencement. Practically all of the two year men are returning to their own farms.

### HORTICULTURAL ASSOCIATION MEETING

The summer meeting of the State Horticultural Association of Pennsylvania was held at the College June 17 and 18. The principal feature of the meeting, in addition to the regular program, was the inspection of the experimental work being done in vegetable, fruit and flower growing.

The sessions of the Association were held in the New Horticultural Building and an innovation which added greatly to the interest of the program was a lecture on Chestnut Culture by C. K. Sober, the most extensive grower in the state, accompanied by moving pictures. All details of the work were shown in action from the young growing trees to the final threshing of the matured nuts. Besides this feature there were several other addresses.

# HORTICULTURAL BUILDING DEDICATED

The new Horticultural Building was dedicated with appropriate ceremonies, June 10. In a brief sketch, Dean R. L. Watts called attention to the importance of the various horticultural products of the state as reported in the 1910 census. It was a matter of surprise to many of the audience to learn that the vegetable interests represent a value of approximately the same as all the fruit crops put together. The figures show that vegetables that year had a total of $10,013,920 and the fruit, $10,691,679. Flowers, plants, nursery products had a total of $4,344,450. The total value of horticultural crops to the state, therefore, is $25,050,049 as reported by the 1910 census. On the basis of the value of the horticultural industries of the state, the investment in the Horticultural Building at the College is thus seen to be less than one two-hundredth.

Mr. C. J. Tyson, President of the Horticultural Society of Pennsylvania, discussed the development of horticulture at the College and pointed more particularly to the wonderful growth made in accession of students. The total enrollment of students in the School of Agriculture during the past decade has increased fifteen times and that of students enrolled in the various courses of horticulture, more than twenty times.

One of the most interesting features of the afternoon was the presentation of a beautiful pastel portrait of Gabriel Heister, a graduate and a former trustee of the institution, formerly President of the State Horticultural Society, and who was well and favorably known to Pennsylvania farmers. This was a gift of the Crab Apple Club, a student organization which handles horticultural matters among the students themselves. Mr. D. H. Stewart, the President, made the presentation. Mr. Bruce W. Bell presented in behalf of the Landscape Gardening Department, a portrait of Frederick Law Olmstead, the greatest American landscape architect.

In a brief address the new head of the Department, Professor M. G. Kains, sketched the Potentialities of Horticulture in Pennsylvania. He pointed to the development of the industry from nothing at all a century ago to the present commercial valuation referred to by Dean Watts. Based upon the fact that the native small fruits have been developed in this period from the wild state to their present prominent position, and that a century ago practically all of our tree fruits were chance seedlings, showed that the potentialities, with respect to literally hundreds of other species, are as yet untouched. In closing he pointed to the fact that the underlying laws, whereby present development has been reached, will apply without limit to all of our present list of cultivated fruits and to hundreds of wild species worthy in importance, demand alone being the governing factor.

Professor F. A. Waugh, of the Massachusetts Agricultural College delivered the address of the day—"The Arts of Peace." He drew a pen picture of war, its horrors and frightful expense, not merely in money, but in destruction of human lives and of business. Then he contrasted agricultural industries, showing the constructive nature of all lines of agricultural effort.

In part he said: "A dozen battle ships sailing away to Tampico and Vera Cruz mean just as big a drain upon this nation in money and men as though a dozen of our biggest colleges were pulled away from their fastenings and sent off to Mexico with all their property, all their officers and all their students.........Generations of devout men and women have prayed that the time would come when nations would learn war no more. Now it seems almost as if that day were in sight; and the greatest guarantee that the time is coming is that men are studying business rather than war. It is one thing to preach peace in the abstract, it is quite another thing to train men for business. The way to do it is to train them in the arts of peace. When men learn to spend the enthusiasm of their lives in growing orchards, in running shops, in the pleasant work of the fields, they will love these pursuits—they will not be diverted from them for any small political quarrels—they will not permit their labors to be consumed by the foolish quarrels of others. Our agricultural colleges have literally taught men to beat their swords into plow shares and their spears into pruning hooks.........The proper pursuit of agriculture opens men's lives—men's hearts and souls—puts them into sympathy with all mankind, touches their imagination with the great beauties and mysteries of nature, and helps them serve the purposes of the Great Creator."

## EXCURSION TRAINS

During the month of June the Pennsylvania Railroad ran five one-day excursions to the College. These trains brought an aggregate of 4000 people. While only a few hours could be spent at the College, all the visitors had the opportunity of getting a bird's eye view of the campus, buildings, farms and the various phases of experimental work in progress.

## CENTRE COUNTY FARMERS' DAY

For a number of years a day has been set aside upon which Centre County farmers have been invited to come to the College and inspect the farms and field experiments. This year it is planned to vary the nature of the day's exercises. The date decided upon is **Friday, August 28**, and the gathering is to be a **Centre County Farmers' Day and Picnic.** Every Centre County farmer and his wife and all of their children and friends are not only invited but urged to bring their baskets, and picnic in the College woods on that day.

The young people are especially invited to be present and participate in stock judging contests which will be a part of the day's exercises.

All sorts of races and stunts in which it is hoped competition from various parts of the county can be developed, will be arranged.

A baseball game between teams composed of those in attendance will be staged. Those who are interested in going over the farms and hearing explanations of the various lines of work, will have the opportunity of doing so.

It is hoped a large crowd will join in making the day a success.

## THE HESSIAN FLY

Reports from various parts of the state indicate that the Hessian fly has caused considerable loss to the wheat crop.

The adult form of this insect resembles a mosquito but is not over one-half as large. There are two broods, a fall brood and a spring brood. The fall brood emerges about the time the first wheat is up and the spring brood the last of April or the early part of May.

The eggs are laid as a rule on the upper side of the leaf blades or sometimes inside of the leaf sheath. These are reddish in color and may be easily found on the new wheat when the insects are abundant. The eggs hatch into reddish grubs, later becoming white, and these grubs suck the sap from the growing stem under the leaf sheath and just above a joint. The insects hatched in the fall feed at the surface of the ground, but those hatched in the spring are as a rule found at the first joint above the ground. The culms, or stalks, infested in the fall usually die, while those attacked in the spring become distorted and weak and break over at the point of attack. The infested culms usually produce only shriveled grain or none at all.

Because of its habits no insecticides can be used effectively against this insect. Ordinarily, the fall brood emerges in time to deposit the eggs on the early sown wheat, and the adults die or at least egg laying ceases after one or two hard frosts. For this reason the early sown wheat generally suffers the most injury. This suggests the advisability of late seeding, that is, near the usual time of the first frosts rather than earlier. If the seeding is deferred too long the plants may not become well enough established to resist winter killing and the loss may be as great as that ordinarily suffered from the fly. It is especially important that late sown wheat be seeded under as favorable conditions, as regards preparation of seed bed and fertilization, as possible.

A good plan is to sow a strip along one side or some on two sides ot the field moderately early. This field should be examined for the eggs about ten days later. If few eggs or none can be found, it is safe to sow the whole crop. If many eggs are found, the seeding should be delayed another week. In case the earlier sown wheat is badly infested it should later be plowed up and reseeded.

The insects emerging in the fall migrate from the old stubble fields to new wheat fields, often traveling considerable distances. The spring adults do not fly far from the field in which they have grown. Co-operation on the part of the farmers of a community is necessary, for a badly infested field may supply enough adults for an entire neighborhood.

# THE EXTENSION BULLETIN

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Vol. I SEPTEMBER, 1914 No. 12

College opens September 16, 1914.

Anyone desiring to take the Two Years' Course in Agriculture should make application at once.

Attention is called to the Winter Courses in Agriculture which begin December 2 and continue for twelve weeks. Those who are interested in any branch of farming will find these Winter Courses helpful. The entire cost including room and board, is about Seventy-five Dollars. For detailed information write for Winter Course Bulletin.

The completion of the Horticultural Building and Stock Judging Pavilion will provide much needed room for the coming college year. The Stock Judging Pavilion is 142 by 62 feet and is built in the form of an arena. The seating capacity is 750. This arena can be divided into three class rooms by means of roller canvas curtains. A complete and modern equipment for meat work including slaughtering, cutting, curing and cooling meat products is provided so that a complete course in handling meats on the farm can be given.

A long felt need is supplied by the new dairy barn. The general arrangement, grouping and structure is different from the barns that have been used in the past. It is believed that the arrangement will result in economy in labor, less danger of losing valuable animals through fire from having a separate barn for the hay and in materially reducing the cost of handling hay by having it on the ground floor.

The barns are built entirely of hollow tile with brick face to the lower window sills. The roof is of asbestos shingles. The barn at the front, which is known as the feed barn, is 100 feet long by 32 feet wide. The entire west half is used for hay, while the east half has a feed room, an office, milking machine room and shower room on the first floor, with a large grain room on the second floor. At right angles and to the east is the main milk room with a dairy house attached. This is 129 feet by 41 feet and will house sixty-one cows. This room is without posts or trusses, has round corners throughout, with cement floor and ceiling and cement plastered walls. There are no ledges for dust to collect, and the stalls and stanchions will be entirely of steel, making the most sanitary construction possible. The double system of ventilation is provided. At the west and at right angles to the feed barn are box stalls for twelve cows, which will be used for cows on special tests or as maternity pens. A section of twelve stanchions is provided for cows under special experiment. Twelve calves can also be accomodated. This room is also being equipped with sanitary stalls and stanchions. At each end of the feed barn will be a silo 18 feet in diameter by 40 feet high. The carrier track system for disposing of the manure, as well as hauling feed from the silos to the different barns, will be installed. Yards and exercise lots for the animals are provided. An open shed 168 feet by 22 feet at one end will be used for bulls, dry cows and the young stock.

## FEEDING FOR WINTER EGGS

Winter eggs are rarely produced profitably except by early-hatched pullets, and there is little to be gained in feeding old stock for eggs at this time.

**Feeds and Feeding.** Corn is unquestionably the most economical grain for poultry feeding, but it is not satisfactory when fed exclusively as it is deficient in protein and ash. It may be fed quite freely to growing stock or pullets on open range. The proper proportion of protein must, however, be made up in some way. With hens that have passed their first year, corn frequently causes overfattening, liver diseases or digestive disorders, and should always be supplemented by other grains, the proportion varying according to the needs of the fowls.

**Other Grains.** The next best grain is wheat, which may be safely fed in any proportion, the chief objection to its use being that it is usually too expensive. Oats, while excellent for poultry, are not a very economical feed as compared with wheat or corn at ordinary market prices. If fed dry, the hulls often make trouble. If steamed before using, all danger from the hulls may be avoided and in this condition it may be fed safely to chickens of all ages. Buckwheat resembles corn in its composition but is less likely to make the fowls overfat. Barley is an excellent substitute for oats or wheat when the price makes it an object. In a general way the feeder, who has a sufficient supply of corn or wheat, has nothing in particular to gain by using other grains unless there is a saving in the cost. Poultry supply houses sell commercial grain mixtures known as "Mixed Grains" or "Scratch Grains," and where wheat is not obtainable at a reasonable price, these mixed grains can sometimes be purchased to good advantage. There is, however, no special advantage in feeding mixtures as compared with feeding different grains alternately.

**The Mash.** Whatever whole grains are used, better results will generally be secured by giving a part of the ration in the form of ground grains, fed either wet or dry, and known as the "Mash." It is commonly believed that fowls are not able to assimilate a sufficient amount of whole grain to secure best results, either in growth or egg production. The mash also makes the ration more palatable and reduces the cost of feeding by utilizing by-products. Generally it will be consumed more freely if moistened and for that reason the wet mash is the basis of feeding for forced growth of egg production. When a surplus has been fed, it should be removed as soon as the hens are through eating. On account of the labor and difficulty associated with feeding wet mash, many prefer to feed it dry. In this condition it is kept before the hens all the time, wtih considerable saving in labor. The objection to dry mash is that frequently, there is an insufficient amount consumed and more whole grains and meat scraps must be fed, making a more expensive ration. It is an open question whether one method is more efficient than the other, but there is no question about the fact that, under many conditions, the mash may be fed dry with satisfactory results and with much economy in time and labor. The dry mash is particularly valuable when hens are kept in very large flocks. It should be fed in hoppers or in open boxes, which should be about a foot deep and large enough to hold a sufficient supply for one or more weeks.

A standard mixture for mash, either wet or dry, is: two parts wheat bran, one part middlings, one part cornmeal, one part meat scraps, and one-fourth part oil meal.. To this mixture may be added, if fed wet, as much steamed cut clover, alfalfa or alfalfa leaves as is found to be palatable to the hens. The mash may be simplified, but not improved, by the omission of corn meal and oil meal. If fed wet, it should be mixed with warm water or milk. It should be moist enough to stick together but should not be sloppy. It may be fed morning, noon or night.

**Animal Food.** In ordinary feeding, protein from vegetable sources does not give as good results as from animal sources. At least one-third of the total protein should be from animal sources. There is no good reason for concluding that one form of animal matter is much better than another, except in the matter of palatability. Green cut bone, if it can be secured at a reasonable cost and kept in good condition is an excellent source. Butchers' scraps or other cheap meat may often be boiled and fed economically in this condition. Most poultrymen, however, find commercial meat scraps the most convenient and cheapest source of animal food. Milk is a partial substitute for meat. It may be fed in mash or given to drink in limited quantities. When heavily fed, it is likely to cause diarrhoea. When used, the most scrupulous cleanliness should be observed as the dishes in which it is fed rapidly become tainted.

**Green Feed and Grit.** It is important that some kind of green food should be supplied when the hens are confined. Almost anything succulent will serve the purpose. It is not desirable to depend entirely on clover and alfalfa in winter. Cabbage, rape, mangels, potatoes, turnips or even ensilage should be provided for variety. Little attention need be given to supplying the hens with grit while on the range. In winter or when in confinement, grit in some form should be supplied. Lime is also needed for shell material. For this purpose oyster shell is excellent and answers the purpose of grit as well.

**How to Feed.** It is not possible to lay down definite rules as to the amount of feed which should be given or the proportions in which different feed stuffs should be combined for best results. Breed, age, season, egg production and price of feeds all have an important bearing on this. While it is true that egg production is governed quite largely by feed consumption, fowls usually keep in better condition if fed somewhat less than they seem to demand. Merely as a guide to correct feeding, the following plan is suggested for a flock of average fowls laying or about to begin laying. The feeder must learn for himself just what modifications are desirable from time to time.

| | |
|---|---|
| Morning: | Feed one ounce of wheat for each hen or one handful to two hens. |
| Noon: | Feed all wet mash that hens will clean up promptly. |
| Evening: | Feed one and one-half to two ounces corn or approximately one handful to each hen. |

If dry mash is fed, fowls may be given access to hopper throughout day, unless mash consumption exceeds one-third of total feed consumed in which case it is better to leave mash hopper open only during latter half of day.

# THE EXTENSION BULLETIN

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Vol. II OCTOBER, 1914 No. 1

Pure-Bred Berkshire Gilts.

# SWINE FEEDING AND MANAGEMENT

Entered as Second-Class Matter Oct. 30, 1913, at the Post Office at State College, Pennsylvania, under the Act of August 24, 1912.

# SWINE FEEDING AND MANAGEMENT

W. H. TOMHAVE
H. H. HAVNER

## IMPORTANCE OF THE SWINE INDUSTRY IN PENNSYLVANIA.

Pork production has not been developed in Pennsylvania to the fullest extent of its possibilities. In the past, it has been primarily a side-line or a by-product on many farms. The prevailing high price of pork has created unusual interest in hog raising among our farmers. many of whom have had no experience in handling hogs. Its possibilities as a specialized industry can be made the source of considerable income to the farmers of the state.

**Modern Types.** Two modern types of hogs are bred in the United States; both can be successfully raised in Pennsylvania. They are the lard and bacon types. The lard type has been developed quite largely in the region of the corn belt, and has been grown more for the amount of fat that it will produce than for an abundance of lean meat. Hogs of this type are more compact, low down, and massive in appearance than those of the bacon type. The general conformation of the lard type should be long, broad, deep, and uniform in depth and width. The body should be supported by strong, straight legs placed squarely under the body. The bacon type is developed and grown mostly for the amount of lean meat and choice bacon that it will produce. These hogs are long, smooth, and deep-bodied with somewhat less width of back and development of ham than the lard type. The bacon type of hog is best adapted to regions where a limited amount of corn is produced and where more of the pork is made from mill feeds and small grains.

**Selection of Breeding Stock.** The selection of breeding stock is an important matter in the starting of a herd of swine. To start with a poor foundation is poor economy because of the difficulty of changing an established herd. The breed to adopt is one of the first things to be decided upon. There is no best breed of hogs. All our modern breeds will answer satisfactorily if they are properly selected and represented by good individuals. In selecting a breed, there are several points to be kept in mind. One is to choose a breed that has proven to be well adapted to the locality in which hogs are to be raised. This will make it possible to secure additional breeding stock of the same kind without great expense in making a selection. A second point to be considered is that a better market will be assured if pure-bred stock is used. Once the breed has been established a change from one breed to another should be guarded against. The breeding or foundation stock should be selected with a view to uniformity of size and quality so far as possible. For commercial pork production it is not necessary to start with all pure-breds. The brood sows may be grades but they should be individuals representing an established breed. The boar should, by all means, be a pure-bred. By following this system, it is possible to grade up a herd in a comparatively short time. Each year the best gilts should be selected for the herd, and inferior females should be sold on the market.

**Boars.** The selection of the boar is the most important feature to be considered in starting a pure-bred or grade herd. No matter if only grade sows are kept, nothing but pure-bred boars should be used. The use of grade and inferior boars has been an important factor in keeping down the quality of the hogs produced in Pennsylvania. The herd boar should possess individual merit and character. He must possess the characteristics of the breed as well as represent the best type of a market hog. He must be masculine in character; not refined like the brood sow. He should have breadth between the eyes and through the forehead. The head should be set well on the body by a short smooth neck. The shoulders must not be rough or coarse as that tendency will increase with age. The top line should rise gradually from the neck to a point in front of the middle of the back so as to give a strong, well-arched back. The slope over the loin and rump should be gradual and not abrupt. Seek a back and loin that is broad, thick, and smooth. Smooth, deep, and uniform sides, free from wrinkles and with plenty of length, are desired. The width of the body should be carried well back so as to provide well-developed hams. Boars are frequently narrow in the hind-quarters, a feature which is objectionable. Plenty of bone is important in all classes of breeding stock and the herd boar is no exception. He should not be coarse, but should have bone of good quality and plenty of substance. The four legs must be set squarely under the four corners of the body. Straight, clean legs, with short, strong pasterns are desirable. A boar that shows weakness of bone and is down in his pasterns should be avoided. This point is too often overlooked and as a result many hogs are weak in this respect. Weakness of bone or conformation of any kind is readily transmitted, usually becoming more difficult to eradicate from the herd as time goes on.

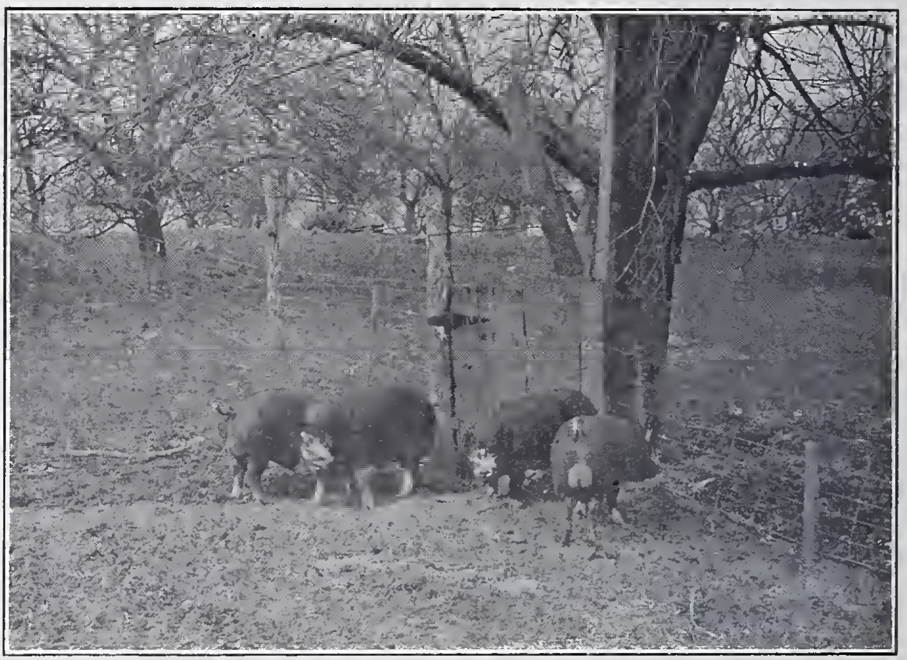

**Fig. 1.—Berkshire Boar Pigs.**

These pigs are true to type, have good bone, strong backs and smooth sides.

**Brood Sow.** The selection of the brood sow is equally as important as that of the boar, although she is not always a pure-bred. The best results can be had only when the females of the herd are individuals which, when mated to good sires, will transmit form and character to their offspring. Size and plenty of bone are equally as important in the brood sow as in the sire. In brood sows less compactness of form with greater length of body is desired, especially throughout the hind-quarters. The back and loin should be deep and well arched as in the case of the sire. Smooth, deep, and long sides are indispensable in good brood sows. A large number of well-developed teats are important. These should range from twelve to fourteen in a sow of the proper conformation. Quiet disposition is essential, as a sow of a nervous temperament frequently proves to be a poor mother.

Prolificacy is one of the essential factors in pork production. The initial cost per head of a litter of pigs is determined by the number of pigs farrowed and reared. Experiments show that the tendency to produce large or small litters is transmitted from parent to offspring. Since this is the case it is always advisable to select breeding stock from large litters. When sows are selected from litters of eight or ten, they are more apt to produce large litters than if they come from litters of five or six. It is equally important that the boar come from a large litter, as he transmits his inherited characteristics as strongly to the offspring as does the female.

**Feeding Breeding Stock.** In feeding brood sows, breeding gilts, and boars, feed must be supplied which furnishes protein and mineral matter to meet the demands of the body. The supply of protein, in sufficient amounts for body growth, is a factor which is quite often overlooked in breeding hogs. In preparing for the breeding season, or during the time the sows are carrying their litters, much bone-building and muscle-forming food is required. To this end, it should be the aim of the hog breeder to meet the demands of the system, and not stunt the sow or breeding boar on these necessary elements. There is a tendency to feed too fattening rations to breeding hogs. This is a time, above all others, when the body does not need an excess of heating and fat-forming material, and when too much feed of such character is a detriment. The method of feeding the breeding herd should vary according to the season of the year. A feeder must learn to determine for himself the proper degree of condition and thrift in the breeding herd. The animals must be fed enough, but an overfat condition is as detrimental as insufficient feed, except that in the former instance the stock will appear in show condition at all times.

**Wintering Brood Sows.** In wintering the breeding herd, there arises the question of a cheap source of protein. Where available, alfalfa and clover hay can be made of use in furnishing this necessary constituent at a low cost. The hay may be used whole or chopped. put in racks, and fed according to the appetites of the hogs. If the sows have nursed a large litter, it will be necessary to feed a grain ration in addition to alfalfa. The amount will vary from one and one-half to two and one-half pounds per one hundred pounds live weight daily, depending upon individuality and the condition of the sows when winter feeding begins. A sow will lose weight while nursing a litter, and she must regain this weight before her next farrowing time and carry her next litter in addition. In case sows are wintered without alfalfa hay, a grain mixture of corn ten parts and tankage one part, or corn five parts and oil meal one part, or corn eight parts, wheat middlings two parts, and tankage one part may be fed.

**Feeding the Boar.** The essential points in the feeding and management of the boars are plenty of exercise and a ration supplying plenty of protein. An exercising lot should be provided both in winter and summer. To make a successful breeder the boar must be active and vigorous. If he is too closely confined he will become fat, lazy, and an uncertain breeder. In summer, if possible, pasture should be provided because it is a cheap source of feed and also keeps the hog in good thrift. Only enough grain should be fed to properly supplement the pasture. If on alfalfa or clover pasture, one and one-half to two pounds of grain per hundred pounds live weight daily will be sufficient. The amount of grain should be regulated to suit the individual and his condition. Feed sufficient to keep the animal in good thrift and to keep up vigor. Two grain mixtures suitable for the purpose are corn four hundred pounds, wheat middlings one hundred and fifty pounds, tankage fifty pounds, oil meal twenty-five pounds; or a mixture of corn four hundred parts, tankage fifty parts, wheat bran twenty-five parts. Too much corn should not be fed. A little ground oats may be introduced into the ration to stimulate vigor. Oats are bulky, however, and should be fed in limited amounts. Sufficient feed to keep up vigor but to avoid a high condition for a breeder should be the rule. Too much fat will ruin a boar for service while in that condition.

## FEEDING AND MANAGEMENT OF BROOD SOWS BEFORE AND AFTER FARROWING.

Four weeks prior to farrowing, it is necessary to increase the amount of grain fed and also to introduce a feed which is of a laxative nature. Breeders are coming more and more to recognize the fact that sows must have feed rich in protein and at a low cost. Sows should not be overfat at farrowing time. If too fat they will be feverish, constipated, and may farrow all of the pigs dead. A suitable grain ration for sows at this time is one consisting of corn four hundred parts, middlings three hundred parts, tankage one hundred part.

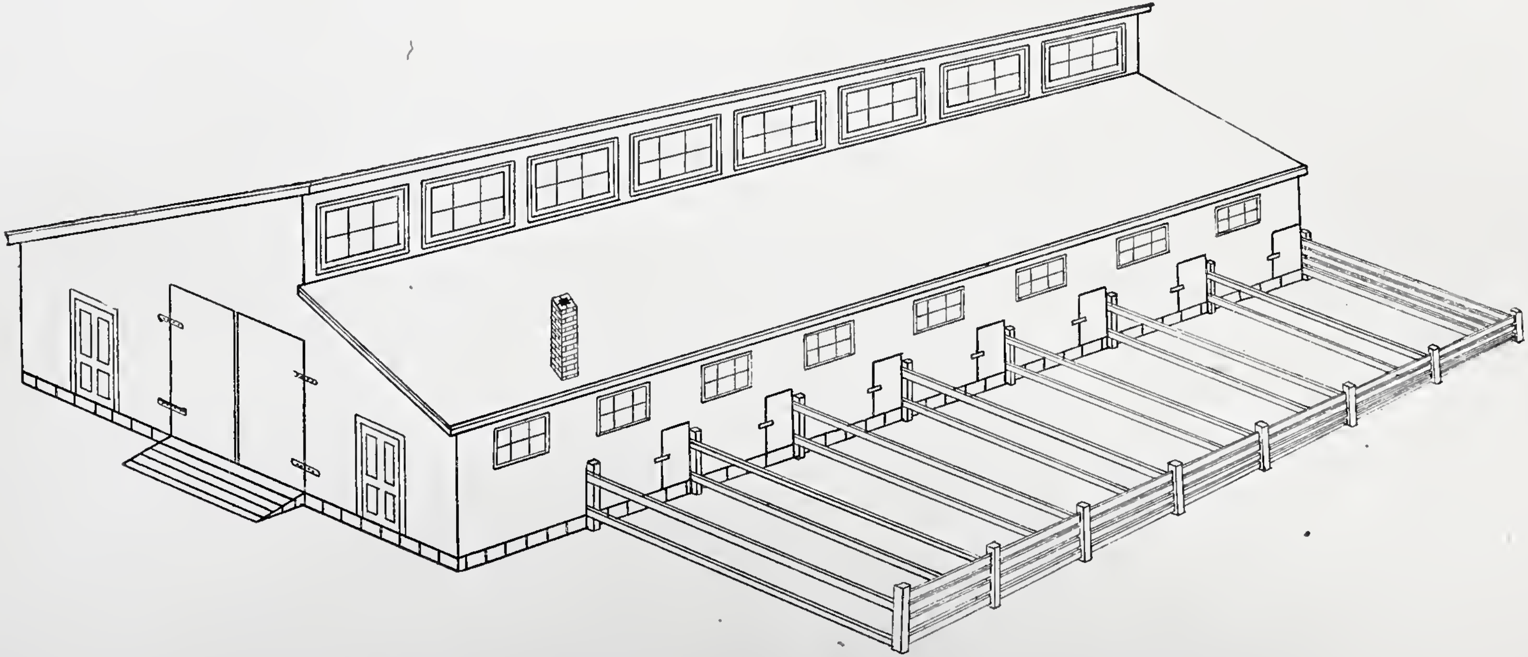

Fig. 2.—A Centralized Hog House with Outside Pens for Exercise. Side and End Elevation, Showing Outside Pens.

and bran fifty parts. Oil meal may be substituted for tankage and the amount increased to one hundred and fifty parts in the mixture. A week or ten days prior to farrowing, the sow should be removed to a farrowing pen which should be dry, comfortable, and roomy. Farrowing pens, in a centralized hog house eight feet square, with lots opening outside make the best quarters.

**Farrowing Time.** A definite date of service should be kept so that time of farrowing may be determined. The period of gestation will be on an average of 112-115 days. The day before farrowing, the sow should receive only a light feed of bran fed wet. A close watch should be kept of the sow when farrowing. If the weather is cold, it is better to remove the pigs from the pen as fast as they are farrowed. They may be put in a basket and placed in a warm room with artificial heat. The pigs may be returned to the sow after she has finished farrowing, and has quieted down. For the first thirty-six hours after farrowing the sow needs nothing but luke warm water to which a little bran may be added. After this the sow can be started gradually on a ration of corn-meal seven parts, tankage one part together with sweet skim-milk in the proportion of one pound of grain mixture to one pound of milk. If sweet skim-milk is not available, a grain mixture of corn-meal four hundred parts, wheat middlings three hundred parts, tankage one hundred parts, and oil meal fifty parts, may be used. When on full feed approximately three to four pounds of a grain mixture per hundred pounds live weight daily per sow will be required. If pasture is available the amount of grain may be decreased to two or three pounds per hundred pounds live weight daily.

**Importance of Exercise.** The sow and pigs should have ample exercise at all times. If, for the first two or three weeks, the weather is not suitable for the pigs to be out in the exercising lot, they should be taken out of the pen each day away from the sow and placed in a runway where they will have room to move about. Pigs nursing sows that are heavy milkers will contract thumps in a very short time if not given exercise. The sow can take her exercise in the lot adjoining her pen. (See Fig. 2.) In the fall of the year, the sow and litter may be turned on pasture when pigs are from two to three weeks old. Ample provision should be made for shelter where pigs and mother will not be crowded. If the pigs are farrowed late in the spring, a pasture crop may also be made use of.

**Weaning Time.** Pigs may be weaned when from four to six weeks old but in most instances it is better to allow them to nurse until they are from seven to ten weeks old. This is an important period in the life of the young pig and many good pigs may be ruined at weaning time. If not properly weaned, growth will be stunted and the pigs will never again make their normal rate of gain. The young pigs should be taught to eat just as soon as they will take food, which is at the age of two weeks. This plan relieves the dam of a part of the burden of supplying food for a large litter. When weaning time comes it is only necessary to reduce the feed of the dam and that will reduce her milk flow gradually. If at the same time the feed of the young pigs be increased they will wean themselves. The common practice of abruptly separating the little pigs from the dam before they have become accustomed to taking feed is detrimental and should not be followed.

**Feeding Young Growing Pigs.** Before weaning time the pigs should have become accustomed to a grain mixture or a slop of sweet milk combined with grain. The Pennsylvania Experiment Station has obtained excellent results with a grain mixture of corn-meal four parts, wheat middlings three parts, and tankage one part, for young growing pigs. The addition of skim-milk would unquestionably increase the rate of gain. If skim-milk is fed with the grain mixture recommended above, the amount of corn-meal could be increased to six parts. A mixture of corn-meal eight parts, tankage one part, or skim-milk three parts, corn-meal one part, can also be used with good results. Whenever possible, pasture crops should be used for growing pigs. To grow out pigs quickly will require from two to four pounds of grain per hundred pounds live weight daily in addition to pasture crops.* The amount of grain fed should be governed largely by the appetite of the pigs. Feed all they will consume without waste twice daily. They should be satisfied so that they will not leave the troughs hungry, but no feed should remain in the troughs after the pigs have finished eating.

In raising pure-bred pigs, a separate lot should be provided for boar and sow pigs. In raising pigs solely on a commercial scale, the barrows and sow pigs may have the run of one lot. Pigs will do better if they are separated into lots of fifteen to twenty. Sufficient trough room is necessary at feeding time so that all pigs will have an equal chance.

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* See page 10.

## METHODS OF FATTENING PIGS FOR MARKET.

As a rule, shoats are fattened for market by one of three methods: dry lot, pasture crops with grain, and following steers.

**Dry-Lot Feeding.** In dry-lot feeding, sufficient shelter should be provided with lots for exercise. Cramped quarters are not conducive to rapid gain and the best thrift of the individuals. Shoats usually weigh from one hundred to one hundred and fifty pounds when put in feed lot. Although a fattening ration is desired, sufficient protein and mineral matter should be supplied for growth and strength of bone. Some rations which may be used are corn ten parts, tankage one part; corn six parts, oil meal one part; corn one part, skim-milk or buttermilk one part.

**Pasture Crops with Grain.** On average pasture, hogs may be fattened on corn alone, although the addition of one-fourth to one-third of a pound of tankage per head daily will improve the thrift and finish. In fattening hogs on pasture, too much must not be expected from the pasture, for at this time the hog demands a concentrated feed, and is not able to make use of as much pasture as when growing and where finish is not considered. The pasture should preferably be one supplying protein, as fat-forming material can be more rapidly supplied with corn. Clover and rape are useful for pastures during the fattening period. In this section corn is the cheapest carbohydrate at this time. The same grain mixture may be used on pasture as in dry lot by increasing the proportion of corn where the pasture is furnishing protein.

**Following Steers.** It has long been recognized that hogs following steers furnish a source of profit each year and futhermore utilize feed which otherwise would be wasted. When broken ear corn is used for steers, one hog is usually allowed for each steer. The hogs in the steer lot should be fed some grain in addition, particularly one furnishing protein. Tankage, oil-meal, and skim-milk are the most common feeds used for this purpose. It is also well to feed some corn in addition. The amount will depend largely upon the condition of the shoats. If too much corn is fed, they will not utilize all of the waste material. When a limited grain ration is fed to steers, the shoats are expected to get at least one-half of their feed from following steers. The gain from hogs following steers is always very satisfactory. The amount of pork produced in the feed lot often tides the feeder over if there is a break in the cattle market which forces him to sell his steers at a loss.

**Pastures.** Grass is the cheapest feed for meat production. Pennsylvania farmers should make greater use of pasture in producing pork. The use of pasture reduces the cost of growing pigs, especially at the present high price of grain. A hog craves a succulent feed of some kind in addition to the grain which it receives. Brood sows can frequently be maintained on pasture only but growing pigs or sows, that have been bred, should receive some grain feed in addition. The time has passed when a hog raiser can afford to pass through a summer without a pasture crop for his hogs. Hog pastures not only mean a supply of protein, but also a cheap source of protein which in turn means a low cost of production. The pasture crops, which are most commonly used, are alfalfa, clover, rape, oats and Canada field peas, and blue grass. Alfalfa, though harder to start, furnishes more bone-building and muscle-forming tissue and experimental feeding results rank this crop high. Brood sows and boars can be carried through the summer on alfalfa pasture where it can be successfully grown and very little grain is required in addition. Allowing the breeding sows the run of the pasture and then feeding enough grain to keep them in satisfactory condition is a good method to follow. Clover, which can be grown in nearly every section of Pennsylvania, though not as high

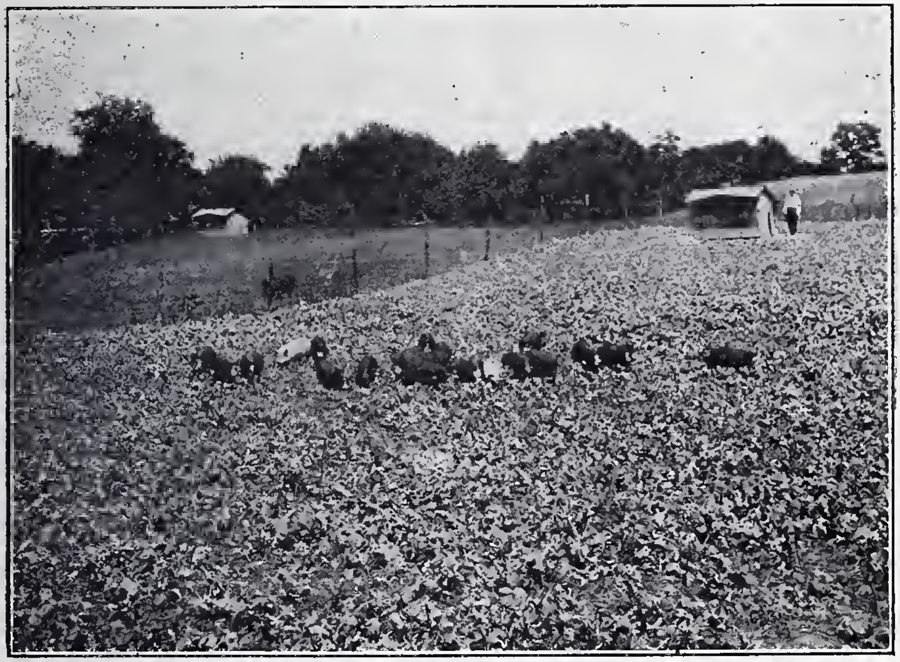


Fig. 3.—Pigs on Rape and Oats Pasture.

in feeding value as alfalfa, makes a very satisfactory summer pasture. It can be supplemented with corn and middlings combined with tankage and oil meal in limited amounts; the grain mixture being fed only in such quantity as to keep sows thrifty and in satisfactory condition.

Rape is an easy crop to grow and one can get started quickly in green feed by using this crop. Rape ranks below alfalfa and clover in value but ranks well in growth and furnishes an abundance of feed from an acre of land. Some supplemental grain feed will be necessary with the pasture. A grain mixture of corn ten parts and tankage one part, or corn-meal six parts, wheat middlings three parts, and tankage one part, may be used to supplement the rape for growing pigs. Twelve parts corn and one part tankage is to be preferred for brood sows.

Oats and peas furnish an early summer pasture, although this pasture will not furnish feed for the entire summer, and it will be necessary to have another pasture crop in readiness to turn the animals into. Rye, though not ranking high in protein as compared to alfalfa, clover or Canada field peas, has the advantage of furnishing a very early spring pasture. A larger grain ration must be fed with rye, the amount to be governed by the condition of the hogs. Blue grass, as a permanent pasture, is of fair feeding value, and when not pastured closely will furnish feed for the entire summer. A bluegrass pasture has an advantage in that permanent fences can be located and no additional labor is required in constructing temporary fences during the rush of spring work. The same grain ration may be used as indicated for supplementing rye pasture.

**Rotating and Planting.** A rotation of rye, oats and Canada field peas, oats and rape, field corn, and rape is desirable. The rye, when sown in the fall at the rate of two bushels per acre, will provide early spring pasture. As soon as the land can be worked in the spring, sow a field to oats and Canada peas at the rate of one and one-half bushels of each per acre. About two weeks later sow a field to oats and rape; the oats at the rate of two bushels and the rape at the rate of five pounds per acre. After the danger of frost is past, sow a field in drills to field corn at the rate of one bushel per acre. During July disk or plow the field that was sown to rye, and sow it to rape at the rate of about eight pounds per acre for fall pasture. This rotation is one that is not expensive, and it will grow well in nearly every section of Pennsylvania. Other crops may be used in some sections.

**Fences.** In pasturing hogs, it is desirable to set aside a piece of land to be used for that purpose each year. It is then possible to put up permanent fences. The best fence to use is a twenty-six inch woven wire with the strands close together at the bottom. When such a fence is erected, it is well to put a strand of barb wire at the bottom and top. The size of field reserved for this purpose will depend upon the number of hogs to be kept. The cost of fencing a four-acre field into acre lots is about as follows: A field thirty-two rods long and twenty rods wide will make four one-acre fields. It will require one hundred and four rods of fence to surround the field. Such a field would require three cross fences of twenty rods each, making a total of one hundred and sixty-four rods for the field. The following is an estimate of the cost:

| | |
|---|---|
| 164 posts 4ft. 6 in, at 10c | $16.40 |
| 164 rods 26-in. woven wire, at 20c | 32.80 |
| 320 rods barb wire, at 3c | 9.60 |
| Staples | .25 |
| Labor | 10.00 |
| 4 gates, at $2.50 | 10.00 |
| Total | $79.05 |

This represents an initital cost of approximately $20.00 per acre. Such a fence properly constructed will be serviceable for a period of ten years. Interest on the money invested at the rate of six per cent. and depreciation will amount to between two and three dollars per acre per year.

**Hogging Down Corn.** This is not a common practice in the East and is looked upon by many as a wasteful method of feeding the corn crop. While it may seem wasteful, experiments conducted at the Pennsylvania Experiment Station indicate that it is an economical method of pork production. It saves labor and the hogs clean up all the corn from the field.

It is true that some of the stover is lost when the hogs harvest the corn. It remains on the land, however, so that none of the fertility is lost. In the test conducted at this Station it was found that the hogs harvesting the corn showed more thrift and were in higher condition than those fed in the dry lot. When a field of corn is to be used for "hogging down," it is well to sow rape betweent the rows just before the last cultivation. This will furnish green food while the hogs are in the lot, and will also reduce the amount of supplementary protein feed necessary.

In case rape is not sown, the corn should be supplemented by tankage or some other nitrogenous feed.

In fencing the field for the hogs, allow them only a small range at first. One acre is large enough for twenty to twenty-five pigs weighing from one hundred and twenty-five to one hundred and fifty pounds. A 26-inch woven wire is sufficient to keep the hogs in the lot. It is not necessary to set many posts. One at each corner of the lot with one in the middle is usually sufficient. Fasten the bottom of the fence to the row of corn stalks along which the wire has been strung. In case a field of four or five acres is to be "hogged down" it is best to fence the whole field and to move the partition each time the hogs are allowed a new part of the field. A fence of this sort can be changed easily and taken up when the hogs have finished the field. Brood sows and stock hogs may be used to follow the fattening hogs in cleaning up the field.

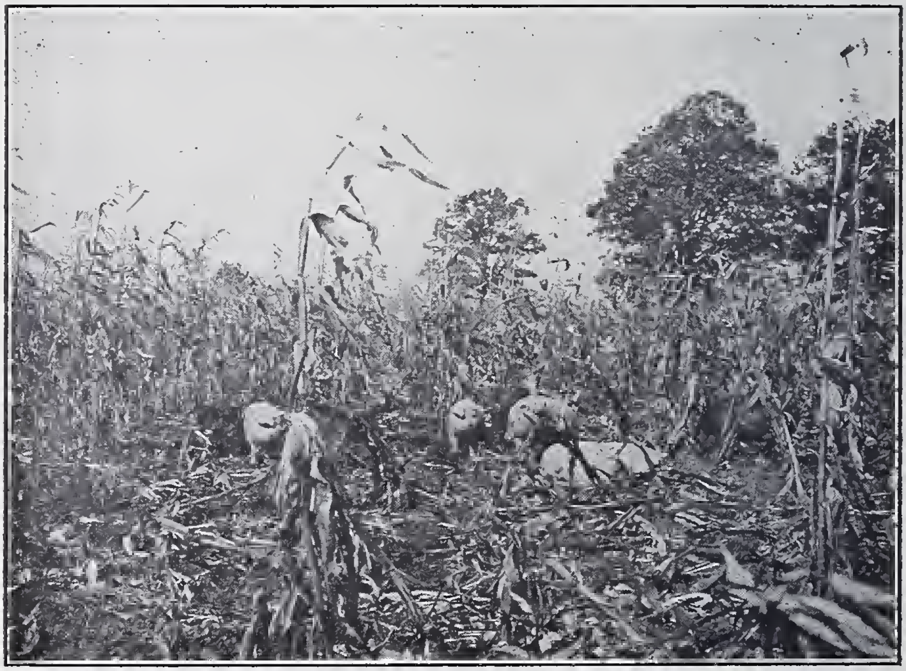


**Fig. 4.—Hogging Down Corn.**

**Shelter.** Hogs, more than any other farm animals, require adequate shelter both winter and summer. During the winter they need protection from the cold because they do not have the thick coat possessed by other animals to keep them warm. During the summer they need protection from the hot sun by some form of shade.

The construction of expensive hog houses is not always warranted. If it is possible to provide the necessary protection by means of cheap shelter, it should be done. Many farmers make a practice of keeping the hogs in small colony houses which are found to be satisfactory. The advantage of these is that they can be moved from place to place and used winter and summer. During the winter they should be kept in a protected place if possible and banked with straw or manure for warmth. There are two types of these houses, namely the "A" shaped and the "Shed-roof" house. The latter is more desirable, as it allows a greater amount of room and is cooler in the summer because the roof does not come so close to the ground. The use of movable colony houses also makes it possible to keep the hogs apart in case of an outbreak of a contagious disease. The number of hogs allowed for each one of these houses depends upon the size of the houses and the hogs. During the winter, four brood sows can easily be kept in one house measuring 8x8 feet. During farrowing time, each sow should be allowed a separate house or some other place suitable for farrowing. The cost of constructing a house of this size need not exceed $15.00 not including the labor of building. The following material is necessary to construct a portable house.

2 pieces 2x6x8 for runners.
8 pieces 2x4x16 for frame.
8 pieces 1x12x12.
5 pieces 1x12x16.
6 pieces 1x12x14.
9 pieces 1x2x6.
Two 4 light windows.
Hinges and nails.
100 square feet roofing.

In case hogs are turned out on pasture and cots or permanent houses are not provided, temporary protection should be put so that they can get into the shade. Pasture with trees generally affords the necessary shade; if these cannot be had, construct a frame covered with old burlap.

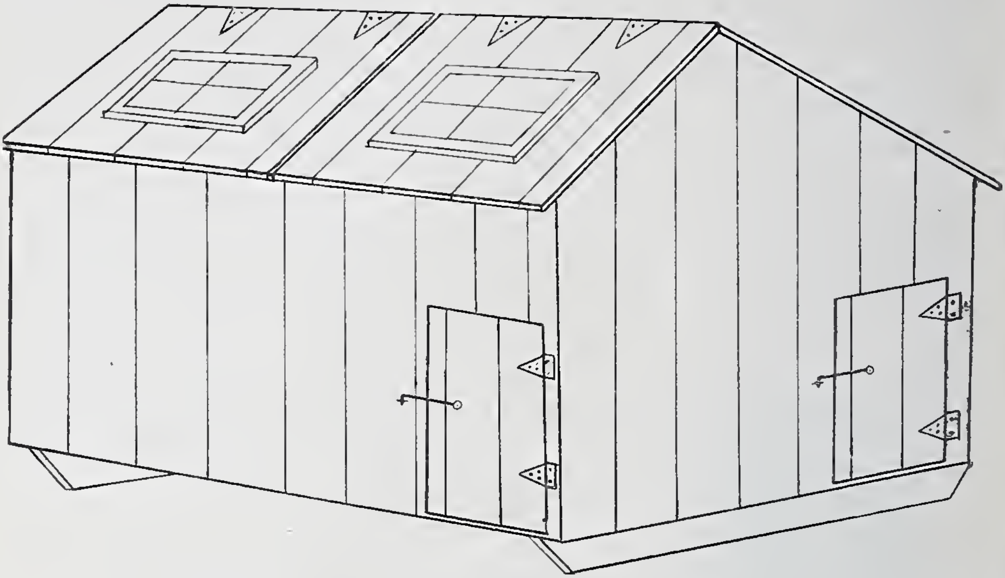


Fig. 5.—Colony Hog House.

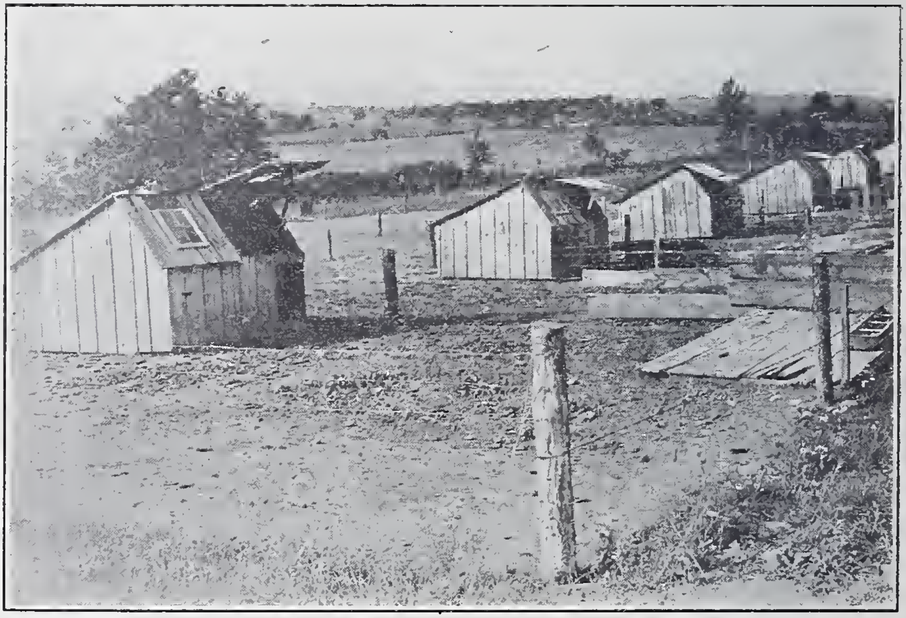


Fig. 6.—Colony Hog Houses and Lots Used for Experimental Feeding and Breeding Herd.

**Hog Houses.** On a farm where pure-bred swine are kept and early spring litters are desired, a permanent hog house is indispensable. The uncertain weather conditions of winter and early spring make it necessary to have farrowing places other than hog cots. In constructing a permanent hog house, it should be made as simple and efficient as possible. A house that can be kept dry and warm and that will admit an abundance of sunlight is desirable. The size of the house will depend upon the number of brood sows to be provided for. The accompanying plan (Fig. 2) has been found to be practical and inexpensive. A hog house of this type may be made any size desired. The submitted plan is that of a house 66 feet long and 24 feet wide, with one row of pens on each side and an alley wide enough to permit the passage of a wagon. A feed room and office on one side, each 8x10 feet, should be provided. The feed room allows for the storage of a considerable amount of feed while the office provides a place where records of litters and breeding may be kept. A stove may be set up in the office so that when sows farrow during cold weather the little pigs may be kept warm. Each pen will afford room for two or three sows except at farrowing time. The partitions between the pens should be removable and larger pens made when necessary. The floors of the hog house should be of cement to permit proper drainage and washing. The beds or farrowing pens should be provided with a board platform over the cement to make it warmer and more comfortable. If the foundation or footing for the cement is made of cinders or sand and covered with tar paper before the cement is put on, the floor will not be very cold. The farrowing pens should be provided with fenders around the edge about six inches from the floor and six inches wide to prevent the sows from lying on the small pigs.

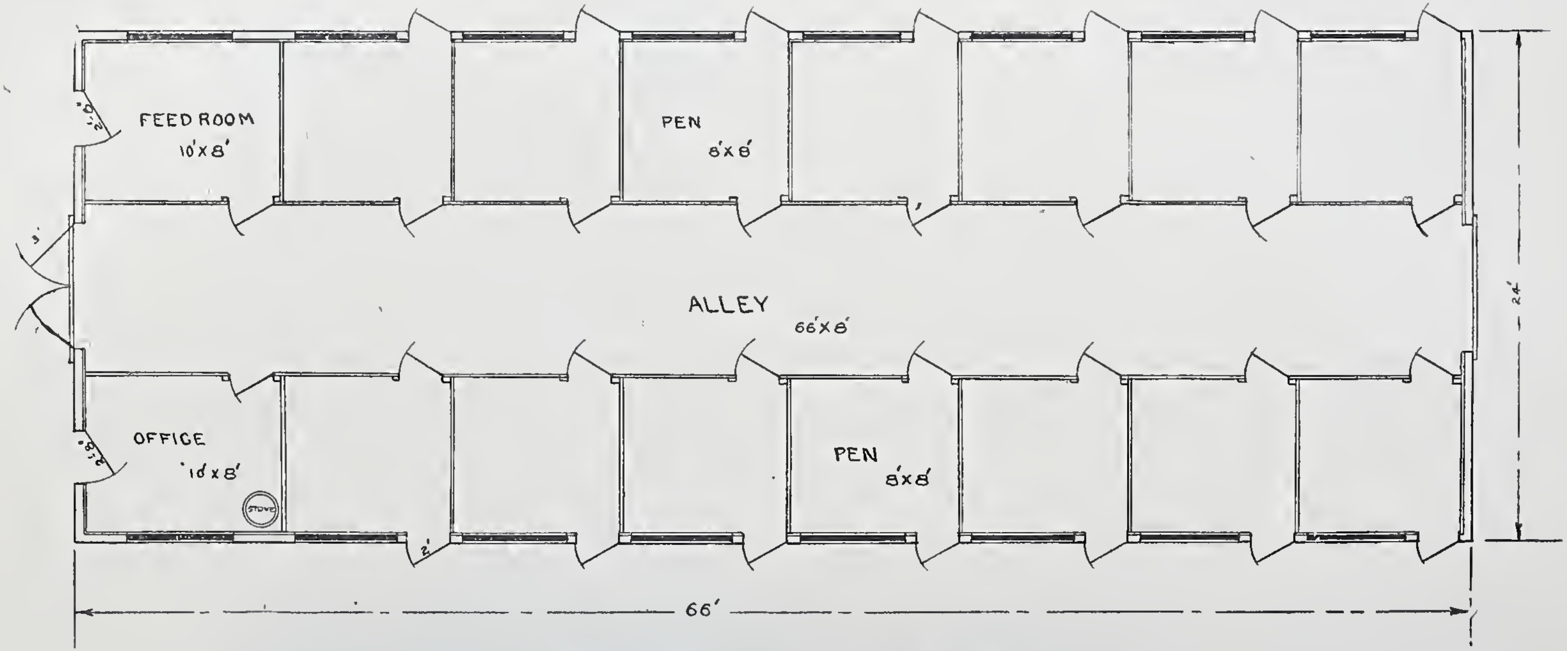


Fig. 7.—Floor Plan of Hog House.

**Feeding Floors.** When hogs are fattened in the dry lot, it is important that the place of feeding be well drained and cleaned. Cement feeding floors are practicable and should be used when dry lot feeding is practiced. The feed can be kept in better condition and the hogs will relish it better than when they are compelled to pick it out of the mud and dirt. The size of the feeding floor will depend on the number of hogs to be fattened. The floor should have sufficient drainage and be rough enough on the surface to keep it from becoming slippery. The following surface plan and cross section indicate the type of feeding floor suitable for the farm.

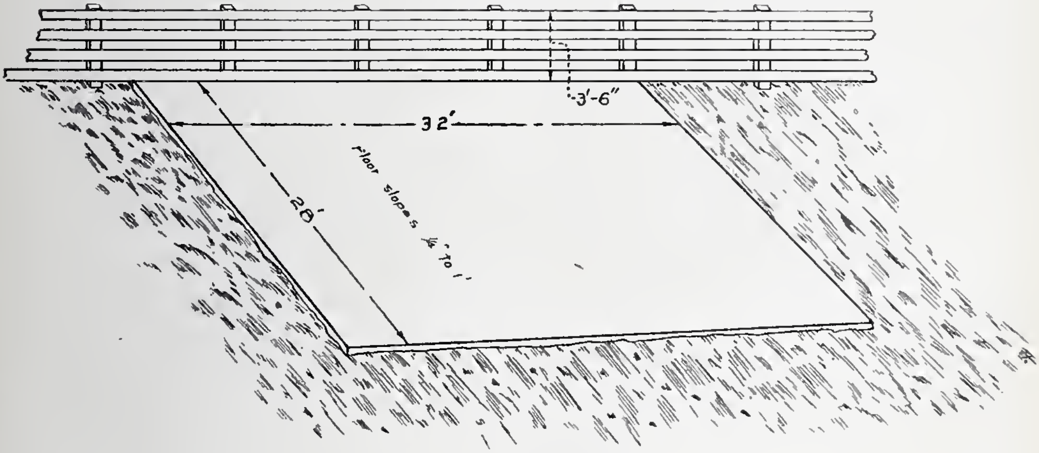


Fig. 8.—Cement Feeding Floor.

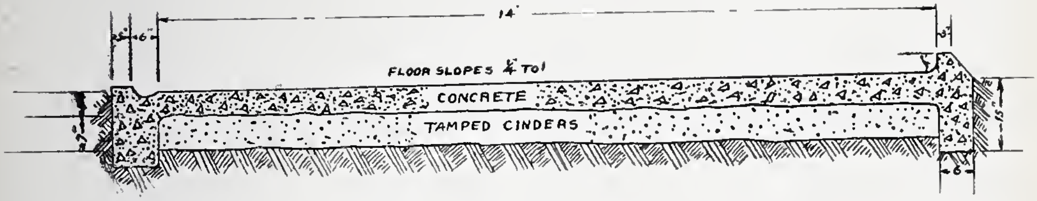


Fig. 9.—Cross Section of Feeding Floor.

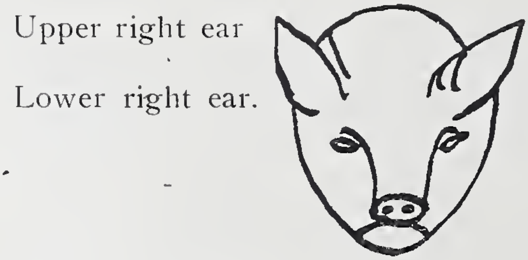
**Gestation Period.** The gestation period of the sows is 112 to 115 days. The period may vary a lttle but the following table can be accepted as nearly accurate:

## GESTATION TABLE FOR SOWS.

| Date of service | Due to farrow | Date of service | Due to farrow | Date of service | Due to farrow |
|---|---|---|---|---|---|
| Jan. 1 | Apr. 23 | May 7 | Aug. 27 | Sept. 3 | Dec. 24 |
| 8 | 30 | 14 | Sept. 3 | 10 | 31 |
| 15 | May 7 | 21 | 10 | 17 | Jan. 7 |
| 22 | 14 | 28 | 17 | 24 | 14 |
| 29 | 21 | June 4 | 24 | Oct. 1 | 21 |
| Feb. 5 | 28 | 11 | Oct. 1 | 8 | 28 |
| 12 | June 4 | 18 | 8 | 15 | Feb. 4 |
| 19 | 11 | 25 | 15 | 22 | 11 |
| 26 | 18 | July 2 | 22 | 29 | 18 |
| Mar. 5 | 25 | 9 | 29 | Nov. 5 | 25 |
| 12 | July 2 | 16 | Nov. 5 | 12 | Mar. 4 |
| 19 | 9 | 23 | 12 | 19 | 11 |
| 26 | 16 | 30 | 19 | 26 | 18 |
| Apr. 2 | 23 | Aug. 6 | 26 | Dec. 3 | 25 |
| 9 | 30 | 13 | Dec. 3 | 10 | Apr. 1 |
| 16 | Aug. 6 | 20 | 10 | 17 | 8 |
| 23 | 13 | 27 | 17 | 24 | 15 |
| 30 | 20 | | | 31 | 22 |

Period of Gestation for Sows, 112 days.

**Marking Pigs for Record.** Where pure-bred swine are raised, it is quite essential that an accurate record be kept of all pigs produced. The best plan is to adopt one of the standard systems of marking the litters before they are weaned. This is usually done when they are two or three weeks old. The use of ear tags in small pigs is somewhat unsatisfactory as they become too small for the ear, causing an irritation, and tear out quite readily. The use of a harness punch to mark the litter is preferred. The following system is simple to operate and makes it possible to keep a record of each litter.



The right ear is used to represent the units, the lower part being used to represent numbers 1, 2, 3, and 4, by corresponding notches. A mark in the upper part of the right ear represents 5. To obtain a mark for litter No. 7 one notch would be placed in the upper part of right ear and two notches in lower part of right ear. The left ear represents the tens column. One mark in lower left represents litter number 10 or when used with two marks in lower right represents No. 12. A mark in upper part of left ear represents No. 50. With this system 99 litters can be marked.

| | Right Ear. | | Left Ear. | |
|---|---|---|---|---|
| Litter No. | Top | Bottom | Top | Bottom |
| 1 | | 1 mark | | |
| 2 | | 2 marks | | |
| 5 | 1 | | | |
| 6 | 1 | 1 | | |
| 7 | 1 | 11 | | |
| 9 | 1 | 1111 | | |
| 10 | | | | 1 |
| 11 | | 1 | | 1 |
| 17 | 1 | 11 | | 1 |
| 28 | 1 | 111 | | 11 |
| 52 | | 11 | 1 | |
| 77 | 1 | 11 | 1 | 11 |

This system will identify the pigs in each litter up to the time they are to be bred or recorded with the record association. When recording or breeding any of them, it is necessary to give them an individual ear mark which is usually done by means of an ear tag carrying a number. It is well to put a tag in each ear so that if one is lost the hog can be identified by the other number.

**Breeding Crate.** When heavy boars are used on small or light sows, it is often advisable to use a breeding crate. The breeding crate will support the boar and take the weight from the sow. When small boars are used on large sows it also makes it possible to raise the boar. The breeding crate should only be used when the sows are in heat and not for forced mating. There are several types of breeding crates on the market, most of which prove satisfactory, and are a good investment if a number of sows are to be bred each year. A breeding crate can also be made on the farm if only a few sows are to be bred.

**Shipping Pure-Bred Pigs.** The farmer who raises pure-bred pigs will frequently sell animals that must be shipped some distance. The only practical way of making such shipments is by express. The express companies demand that all live stock be securely crated before it is accepted for shipment. The crates should be made of light weight lumber so that the weight of the crate will not add too much to the express charges. All pieces should be well nailed, preferably with coat nails, so that the crate will not come apart in transit. When the hogs are to be on the road for more than twenty-four hours, some provision for feeding should be made in the crate. Heavy hogs should not be shipped during excessively hot weather, as there is danger from overheating. Before shipping it is well to disinfect not only the hogs with a coal-tar dip, but also the crate if it has been used before. Put clean straw or shavings in the bottom of the crate before the hog is put in. Securely nail the door so that it cannot be opened without drawing the nails. Fasten two tags on the crate in places from which they cannot be easily torn away. These should bear the name and address of the person to whom the hog is consigned and also the name and address of the shipper. The shipper should always inform the purchaser one or two days in advance of shipment so that delivery can be accepted as soon as the hog reaches its destination.

# DISEASES OF SWINE

## IMPORTANCE OF CONTROL OF DISEASE.

Loss due to disease is one of the uncertainties which makes it impossible to figure the total profit in hog raising before the hogs are marketed. A hog raiser can be put out of business in short order by disease, consequently its control and the reduction of loss to a minimum is essential. From figures recently published, it is estimated that hog cholera cost the farmers of the corn belt sixty millions of dollars during the year 1913. Such figures indicate plainly the necessity of concentrating all possible efforts in combating hog cholera. The loss due to other diseases, however, must also be guarded against. These diseases, though responsible for minor loss in well managed herds, may cause aggravated conditions under mismanagement.

## GENERAL MEASURES OF PREVENTION.

The fundamental principles of prevention of disease consist in feeding properly-balanced rations, supplying clean, comfortable quarters and feeding floors, keeping troughs and pens free from filth, buying nothing but clean stock, and giving close attention at all times to the needs of the individual. Improperly balanced rations bring on rachitis, paralysis and unthriftiness. Proper feeding should be the aim of every hog producer. Cold, damp quarters cause rheumatism, colds, and pneumonia, while dusty quarters encourage the harboring and spread of disease germs. When new individuals are purchased it is well to place them in quarantine for 10 to 15 days before putting them with the other hogs. If it happened that the newly-purchased hogs had contracted hog cholera in shipment, or prior to shipping, the disease would be confined to one pen and would not be introduced into the herd. If practicable, it is also well to thoroughly disinfect the feet and bodies of the new hogs with a solution of one of the coal-tar dips.

## DISEASES CAUSED BY IMPROPER FEEDING.

**Constipation.** This may be a symptom or complication of another disease or may be caused by an improper combination of feeding stuffs and is in the latter case a disease in itself.

*Symptoms*: Notice straining and attempts to defecate. Hog dull, listless, looses appetite. Droppings hard and dry.

*Treatment*: Change feed to a sloppy diet containing bran. Give doses of castor oil or Epsom salts. Rectal injections assist in a more rapid recovery.

**Rachitis.** This disease is brought about by the lack of mineral matter in the feed. It occurs in growing hogs that are fed daily upon corn. Close, crowded quarters encourage the condition.

*Symptoms*: Animal seems unable to bear any weight with hind legs. Bones in hind limbs may become fractured or bent. Distortion of bones of face may take place: this condition being commonly known as "snuffles."

*Treatment*: Prevention lies in feeding properly-balanced rations to the growing hogs. Use with corn a feed which supplies protein and mineral matter in sufficient amount. Feeds which supply protein and mineral matter are tankage, oil-meal, skim-milk or butter-milk. Provide comfortable quarters and plenty of room for exercise.

**Diarrhea.** Like constipation, it may be a symptom of another disease or it may be brought on by irritant feeds. Sudden change from dry to green feed or irritation from intestinal worms may bring on condition. Treatment consists in avoiding conditions which are favorable to it; if a symptom of another disease, treat the original ailment first. Give light, sloppy diet and physics. Craig advises a preparation of bismuth subnitrate (1 quarter ounce), bicarbonate of soda (one-half ounce), Salo (one quarter ounce). Give a teaspoonful in drench three or four times a day.

**Poisoning.** This is a fairly common condition among swine, largely growing out of the impression that a hog can thrive on any kind of refuse and waste material. The common forms of poisoning are caused by feeding meat brine, wash water, and cottonseed meal. Meat brine will produce poisoning because as a rule hogs are not accustomed to salt and they will therefore eat greedily of the mixture. The brine material causes a severe irritation of the intestines.

*Symptoms*: Restlessness, convulsions, frothing at mouth, vomiting, severe pain, stupor and paralysis.

*Treatment*: Produce vomiting as quickly as possible. Give doses of zinc sulphate (15 to 20 grains) in warm water as an emetic. Raw. linseed oil will assist in part in relieving irritation of intestines.

Poisoning from wash water occurs when hogs are fed slop to which wash water has been added. When slop is collected from hotels and restaurants, it sometimes happens that wash water has been poured into the slop barrel by careless attendants. Lye is the active poison in wash water. The symptoms are dullness, vomiting, marked diarrhea, abdominal tenderness, and nervousness. Vinegar given in the early stages has a beneficial action, as it overcomes the marked alkaline conditions.

Hogs that are fed cottonseed meal will develop symptoms of poisoning after a period of feeding. There are many other feeds which furnish protein at as low a cost as cottonseed and the owner runs no risk by using them. As a rule, no trouble will result from hogs following steers that are being fed cottonseed because the amount coming through in the droppings is very small.

## DISEASES CAUSED BY PARASITES.

**Lice.** Lousiness in hogs must at all times be carefully guarded against. Lice cause irritation of the skin which causes the animal to seek relief by rubbing. They are an annoyance to pigs and satisfactory gains are not to be expected from lousy hogs.

There are a number of ways by which hogs may be rid of lice. A very practical scheme for summer is the use of a cement wallowing pool. One or more pools can be constructed as may be required by the number of hogs and the system under which they are kept. (See Fig. 10). A pool 18 feet in diameter is a common size. The ground should first be excavated and preparation made for cementing a hollow pool. The pool should slope gradually from edge to middle and have a depth of from two to two and one-half feet at the center. A drain should be made in the center so that disinfection solution can be drained off before it becomes filthy. By the use of the pool, self-dipping of hogs is made possible. After the pool is filled with water, one of the standard coal-tar dips may be added according to directions. The hogs may then be allowed access to the pool throughout the warm months; thus they will attend to dipping themselves and will be free from lice.

Another method is by the use of a dipping tank or by sprinkling them with a good coal-tar disinfectant diluted with water. In case of dipping or sprinkling the process should be repeated in ten days, as the first dipping destroys only the lice and not the eggs. At the end of ten days, the remaining eggs will have hatched and the second dipping will eradicate the remaining lice. Kerosene emulsion may also be used. Crude process oil will also destroy lice and in addition their eggs. One application of the crude oil is usually sufficient. Rubbing posts offer a very convenient method of applying the oil

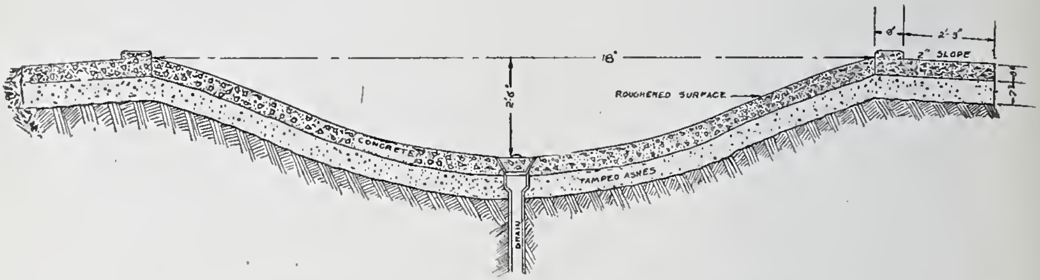


Fig. 10.—Cement Wallowing Pool—Cross Section.

**Lung Worms.** These parasites, though no serious obstacle in well-managed and well-fed pigs, may prove of considerable detriment in stunted and unthrifty pigs. The complete life history of the parasite is not definitely known, but it is believed that the adult worms lay eggs in the bronchial tubes which are coughed up and from which are developed the young embryos which remain in the outside surroundings, and which may be inhaled later to be hatched again into the adult. Dusty quarters seem to encourage the spread of infection and damp surroundings are favorable to the development of the embryos.

*Symptoms*: The pigs have a spasmatic cough which appears to be aggravated by moving about after coming from their quarters. Healthy, well-cared-for pigs will outgrow the condition, while weak individuals, improperly fed and managed, will become unthrifty and stunted in growth. Slaughtered hogs frequently show the worms in the bronchial tubes but the lung tissue is seldom diseased in these cases.

*Prevention.* The avoidance of lung worms rests entirely in preventive measures. The sleeping quarters should be kept as free from dust as possible and the houses disinfected frequently. Mud holes in the lots should be filled to protect the pens from dampness and filth and also to prevent the pigs from wallowing in the mud and carrying dirt and dust into the house. Medicinal treatment is of practically no value. The feeding of properly-balanced rations in sufficient quantity to keep the pigs gaining so that they will outgrow the condition is the best remedy.

**Intestinal Worms.** There are four kinds of worms which may be found in the intestines. These are the round worm (*ascaris suilla*) which is of quite common occurrence; the thorn-headed worm (*echinorynchus gigas*) also occurring frequently; the pin worm (*Esophagostama dentatum*) very small and not as troublesome as the former two; and lastly the whip worm (*Trichocephalus crenatus*) which is not very common. The thorn-headed worm requires an intermediate host which is usually the larvae of the May beetle. The eggs which are laid in the intestines of the hog pass off in the excrement which is scattered over the lots and in the manure heaps. These eggs are eaten by the white grub in which they are encysted, and later the grubs are eaten by the hogs. The round worm, pin worm, and whip worm are spread from one hog to another by the ingestion of food and drinking water containing the eggs or ova which are laid in the intestines and which pass off with the feeds.

*Symptoms*: In general, the symptoms are unthriftiness, diarrhea, nervousness, irregular appetite, loss of appetite, and the passing of worms in the solid excrement.

*Prevention and Treatment*: Prevention is far better than treatment of the condition. The pens should be well-drained and free from mud-holes, and the feeding floors should be kept dry and clean. The drinking water should be pure and free from contamination and the troughs cleaned daily. The manure should be removed from the pens and lots frequently, and put on the fields where it will be of value as fertilizer. The use of hog manure as a fertilizer is overlooked in most cases of hog management. By getting the manure out on the field, one not only gains cleanliness in the lots and pens, but fertility as well. Well-fed and well-housed pigs will have very little trouble from intestinal worms. Along with the grain ration a mixture of salt, wood-ashes and sulphur, kept in a dry place where it is accessible at all times, will tend to ward off the trouble.

The direct medicinal treatment consists in the administration of turpentine or a combination of areca nut, santonin and calomel, given in proportion to the live weight of the hog. In dosing for worms, the pigs should be divided into groups of four or five in each pen, the feed withheld for twelve hours, and the medicine then given in slop or mixed with grain feed. If turpentine is used, the usual dose is a teaspoonful to eighty pounds live weight. Turpentine is best given in milk where it will form an emulsion. It is well to repeat the administration of turpentine for three consecutive days. In administering areca nut, santonin, and calomel, give the powdered areca nut at the rate of a grain per pound live weight of hog, santonin three grains per 100 pounds live weight, calomel two grains for a 100 pound pig, and sodium bicarbonate one-half dram per pig. After separating the pigs into groups, get the total live weight, and then figure the exact amount of the various ingredients and give at a single dose mixed with the grain feed in form of a thick slop.

## DISEASES CAUSED BY IMPROPER HOUSING.

Damp pens and houses are a fruitful source of disease. Rheumatism, bronchitis, and pneumonia seldom occur in herds that are housed in clean, warm, dry pens. These diseases may be serious drawbacks in the hog business if the herds are neglected. Dampness invites rheumatism, encourages bronchitis and favors pneumonia.

### Rheumatism.

*Symptoms*: Lameness, stiffness, swelling of joints, painful movement. Stiffness occurs especially in hindquarters. Hog eats sparingly or loses appetite entirely.

*Prevention and Treatment*: Provide dry quarters. Put hogs on a sloppy diet and give salicyclate of soda in 30 to 40 grain doses dissolved in water four times a day.

**Sore Throat.** Sore throat is caused by crowded pens, filthy surroundings, wallowing in cold springs, and exposure to storm. There is loss of appetite, a cough, and the throat may appear swollen. Clean, roomy quarters with a sloppy nourishing ration is usually all that is necessary in treatment of affected individuals. In severe cases a blister may be applied to the throat.

**Bronchitis.** Bronchitis is caused by crowded, badly-ventilated quarters, and housing in dusty pens. The disease may assume an acute or chronic form. In the latter a gradual loss of flesh, unthriftiness, and a cough constitute the principal symptoms. In the acute form of bronchitis there is a loss of appetite, fever, depression, quickened respirations and coughing spells. The coughing is increased when air passages are irritated by dust while the pig is exercising. The provision of suitable quarters and avoidance of dust and filth in houses constitutes the main prevention. Proper hygienic care with careful feeding hastens recovery.

**Pneumonia.** The causes of pneumonia are the same as those of sore throat and bronchitis, but in addition there may be mentioned sudden changing from warm to draughty pens, shipping in cold weather, and severe exercise.

*Symptoms*: The disease usually begins with a chill which is followed by a high temperature, fever, quickened heart beat, and rapid breathing. Breathing becomes changed from the normal sound to rattling, crepitating respirations. Cough is at first dry, later becoming more moist and loose. Only slightly over 50 per cent. of cases recover. Careful nursing will bring about recovery in cases that would result fatally under careless management.

*Treatment*: Prevention should always be considered first. After disease occurs castor oil may be given to keep bowels open. Provide a warm place for patient but have plenty of ventilation. Turpentine and lard applied to sides of chest as an irritant has a beneficial effect. Give nourishing feed, preferably warm.

## INFECTIOUS DISEASES.

**Hog Cholera.** Hog cholera is a contagious, infectious disease, caused by an ultra-microsopic organism. The virus will pass through the finest porcelain filter made and the blood of a hog with cholera after filtering will uniformly produce hog cholera when injected into healthy hogs. The disease is spread from one farm to another by birds, dogs, persons carrying litter on their feet, and by contaminated streams. It may also be spread by transferring hogs from an infected herd to a healthy one.

*Symptoms*: In an outbreak of any disease of a peculiar nature one should always be suspicious of hog cholera. Too many times it happens that the disease is not given serious consideration at the start. The hogs will first be noticed to be "off feed." They will lie on their bellies and seek seclusion by hiding under bedding or in a corner of the pen or house. Upon close examination the eyes will be found to be watering profusely and the temperature will be raised to 105 to 109 Farenheit. Red blotches or spots occur on the belly and about the ears. Constipation is quite a constant symptom at the start. This is later followed by diarrhea. A cough may be present although this is not a constant symptom. Unsteadiness in the gait and wobbling resulting from weakness are noted.

### Management of Herd in an Outbreak of Cholera.

Send for a competent veterinarian or notify the Live Stock Sanitary Board at Harrisburg, Pennsylvania, by telegraph or telephone. The healthy hogs should be taken out of the infected pen, divided into groups of three or four, and placed in temporarily constructed pens upon ground never used for hogs before. Have your veterinarian vaccinate the healthy hogs with hog cholera serum. The isolation of the healthy hogs should be as complete as possible. New troughs should be provided for the new pens, and the utensils used in feeding and watering should be such as never have been used before except for healthy hogs. The attendant who feeds and waters the healthy hogs should not go near the infected pen until all danger is past. The pen in which the outbreak has occurred should be cleaned and the refuse and dead hogs burned. A thorough disinfection of pens and lots should follow. In case of an outbreak, if the disease is reported promptly and steps are taken for immediate isolation, the spread will be checked. If the disease is allowed to run its course without attention, it will be but a short time until a majority of the individuals in the herd will contract it.

### Some Suggestions for the Prevention and Treatment of Hog Cholera.

1. Feed clean food and properly-balanced rations.
2. Keep troughs clean and free from dirt and filth. Disinfect pens with a dip solution once a week.
3. Put all new hogs in quarantine for two weeks before putting them in with the clean herd. Never peddle a boar around for service, never breed to a peddled boar, nor allow your boar to serve strange sows.
4. Watch out for birds and dogs as carriers of infection. Never allow a neighbor to enter your hog pen if there is a strange disease among his hogs. Keep away from your neighbor's pen also.
5. Keep a mixture of charcoal, salt and sulphur in a clean, dry place where it will be accessible to hogs at all times.

6. In an outbreak, notify immediately a competent veterinarian or the Live Stock Sanitary Board, Harrisburg, Pa.
7. In case of hog cholera remove healthy hogs from infected pens and vaccinate them.
8. Burn dead hogs and refuse, clean up pen and thoroughly disinfect premises.

**Tuberculosis.** Tuberculosis is caused by a germ known as the "bacillus tuberculosis" and is a disease which is contracted very easily by swine when fed contaminated milk from a dairy. Hogs will also contract the disease when following tubercular steers in the feed lot. The report of the United States Bureau of Animal Industry for 1909 shows that 45,113 carcasses and 791,735 parts were condemned for tuberculosis, while in 1910, 31,517 carcasses and 870,361 parts were condemned. Tuberculosis in hogs occurs continually in districts where there are tubercular cattle. When skim-milk is fed, unless it is known that it is free from disease, it should be heated to 178° F. for three minutes to destroy the tubercular bacilli. Prevention is the only logical method of eradication. In dairy districts, it is especially important that the spread of the disease be guarded against. Never feed hogs the offal from slaughter houses unless it has been previously heated under high steam pressure.

# THE EXTENSION BULLETIN

**Issued Monthly by the Department of Agricultural Extension of The Pennsylvania State College**

Entered as Second-Class Matter Oct. 30, 1913, at the Post Office at State College, Pennsylvania, under the Act of August 24, 1912.

**Vol. II** NOVEMBER, 1914 **No. 2**

The Winter Courses in Agriculture and Home Economics will open December 2d and continue 12 weeks.

For the first time since short courses were inauguarated at The Pennsylvania State College, women will be given an equal opportunity with men to specialize in their particular field of work. This opportunity will be provided by short courses in Home Economics.

Write the Department of Agricultural Extension, State College, Penna., for bulletins giving complete information about these courses.

Attention is again called to Farmers' Week, December 28, 1914, to January 2, 1915. Sections of interest to the specialist, the general farmer, and to women, will be provided. Make your plans now to attend this meeting. The December issue of The Extension Bulletin will contain the detailed program.

Miss Pearl MacDonald has recently been appointed to take charge of Extension work in Home Economics. Miss MacDonald was graduated from the University of Michigan, in 1898 after which she taught in the public schools of Michigan, her native state, for several years. A subsequent course in Home Economics at Columbia University, and several years of experience in charge of Domestic Economy Courses at the Michigan Agricultural College and the Wauwatoosa, Wisconsin, Agricultural School, by which institutions considerable extension service is rendered, have prepared her especially well to take up similar work in Pennsylvania. Miss MacDonald possesses tact, an attractive personality, and high ideals, as may be seen by her introductory statements appearing in this issue, and she will be pleased to hear from persons desiring to avail themselves of her services.

# HOME ECONOMICS

The subject of Home Economics is one in which the women throughout our country are becoming more and more interested. It is a subject so broad and far-reaching in its content that it touches vitally the life and well-being of every individual in every walk.

For a long time, Home Economics has meant merely cooking and sewing but it includes much more. When we consider carefully the entire field, and study the content of the various subjects that are now included under the head of Home Economics, we find that, so far as the subject matter is concerned, it falls naturally into outline under the broad general headings of shelter, clothing, food, the personal growth and development of the individual, and the relation of the individual to the family, to the community in which he lives, and to the state. Indeed, the whole of life is summed up in those problems, and these are the things concerning which every woman should have a practical knowledge, if she would do the most and best for herself, and the members of her family.

First, in the problem of shelter, there is the study of the house, the location most suitable in respect to sunlight, soil and drainage; the proper construction with a view to the right sanitary conditions; the best arrangement considering health and convenience; the most approved methods of heating, lighting, ventilation, plumbing; the most desirable furnishings from the point of view of health, utility, and artistic beauty. In connection with the study of the house, there are the principles of household management, the right proportionment of income for rent, food, clothing, operating expenses, and the things pertaining to the higher life, such as music, books, art, travel, etc.; the best methods of keeping accounts; the correct solution of the problem of increasing the income and diminishing the expenditures—a matter particularly important at this time, and one that calls for a very careful weighing and balancing of values and determination of the things most worth while.

As to clothing, there is the problem of personal hygiene; the effect of clothing upon health; the kind and amount suitable to the season of the year, to the age and occupation of the individual; the question of dress as the expression of the personality and character of the wearer.

In the matter of food, there is the study of all the foods; the class to which each belongs; the chemical composition of the various foods; the purpose or purposes each serves in the body; the foods suitable for the young, the middle-aged and elderly people, and for the sick and convalescent; the kind and amount necessary to attain the highest efficiency; the mastery of the principles of cookery, the processes involved, and the art of economic buying.

The last heading—the person's individual growth and development and his relation to the family, the community, and the state—is by far the most improtant phase of the subject of Home Economics, because it deals with the moral and spiritual development of the individual. We all agree that character building is the supreme thing in life. The right kind of food, the proper clothing, suitable shelter and environment are only a means to an end. They make it possible for the individual to attain his highest efficiency as an individual and as a citizen. Food of the right kind, properly prepared, is not merely that which satisfies hunger but it is that which gives physical and mental and moral efficiency. Clothing made of suitable material and appropriate in style not only serves the needs and comfort of the individual but satisfies the aesthetic taste as well. A home which is suitably furnished and kept neat and clean, and in which there is present the real home spirit, supplies the conditions for the health, happiness, and well-being of its members.

These are the things that make it possible for the individual to formulate a worthy purpose in life, to establish reasonable and right standards of life, to develop sane judgment in determining the factors of value and choice, to give self-control, to find joy and to obtain results in his work, to be of service to his fellowmen.

To the women everywhere who have neither the time nor the opportunity to make investigations and try experiments for themselves, and who have not the time to take prescribed courses of training in the schools, but who must get workable knowledge in the quickest way and in the clearest, most concise form possible, it is the great purpose of the Extension Department of Home Economics to bring the results of the vast amount of work that has been done through scientific investigation and experiment, the results of which represent a vast fund of knowldege that will, in many cases, help the homekeeper to simplify and shorten her methods of work—a knowledge which will give the reasons for the many methods and processes used in the home. The reasons why stimulate the interest in work and furnish the incentives for higher attainments.

Great changes in the commercial and industrial world, the very great number of improvements and inventions, the wider use of steam, gas, and electricity, which has revolutionized the methods of work in the industries and affected the cost of commodities, the increased number of commodities of varying value on the market, compel the women of today to take account of these things and require them to have a wider, more scientific knowledge and training in order to meet and solve the present problems of living.

It is the wish and desire of the Extension Department to present to women the wider and higher vision of the work of women, and to make them more conscious of the fact that "the home is the unit of society, that in the home center all of the issues of life, and that on the home foundation is built all that is good in the state and in the individual:" that the homes of the nation determine the state of society and the character of the national life; that the character of the homes is determined by the efficiency of the women in the homes. It is the wish of the Department also to foster a greater realizing sense of the beauty and dignity, of the power and responsibility, of the spiritual importance of the work which is peculiarly woman's work, of the satisfying joy to be found in that work.

The mother in the home controls, in large measure, the physical well-being of the members of the family; she is the one who shapes and guides the tendencies of the children; who is responsible for the character of the habits formed, for the mental and moral development of the children; who is the inspiration of the later work of their lives. For the proper fulfillment of this great task, all will agree that woman needs all of the knowledge and training and inspiration that it is possible to acquire. To have fulfilled her duty to her family and home in the noblest and best way, is to have rendered to the family, to the state, and to the nation the highest and most enduring service that can be rendered by an individual.

# THE EXTENSION BULLETIN

Issued Monthly by the Department of Agricultural
Extension of The Pennsylvania State College

Vol. II DECEMBER, 1914 No. 3

## FARMERS' WEEK NUMBER

A FARMERS' WEEK GROUP, 1913-14

## FARMERS' WEEK

### December 28, 1914, to January 2, 1915

### PROGRAM

Entered as Second-Class Matter Oct. 30, 1913, at the Post Office at State College, Pennsylvania, under the Act of August 24, 1912.

# FARMERS' WEEK PROGRAM

The tenth annual Farmers' Week of The Pennsylvania State College will be held from **December 28, 1914, to January 2, 1915.**

This meeting is held during the holiday vacation when the regular students are away from the college so that the large number of visitors who come may be satisfactorily cared for.

The program herewith offered is more varied than ever before, and it is hoped that it will prove attractive and helpful to everyone, whether that one be interested in some special branch of agriculture, in general farming, or in the home.

For Farmers' Week this year a special effort has been made to prepare a program of interest to the women of the State. Lectures and demonstrations will be given in cooking and infant feeding. There will be practical work in garment making and lectures on textiles and the art of buying. Particular emphasis will be put upon methods of saving time and labor. The furnishing of the home and the place of art in the home will also receive attention.

A number of interesting exhibits are being prepared, and it is believed that the entire week will prove most helpful and profitable to all women who attend.

Attention is directed to the special program for boys on page 11.

The regular program in Home Economics offers much of interest for girls. Special sections will be arranged for girls during the week if they desire it.

**Accommodations.** Ample living accommodations may be found in the village at from $1.00 to $2.00 per day.

**Railroad Rates.** The railroads have authorized the following rates: Two cents per mile with a minimum of $1.00 for the round-trip from points in Pennsylvania, going and returning via same route.

Tickets may be purchased to Bellefonte, Lemont or Williamsport.

**Routes.** Persons coming from the south and west via the Pennsylvania Railroad should change at Tyrone for Bellefonte; those coming from the north via the Pennsylvania Railroad should change at Lock Haven, and via the Beech Creek, at Mill Hall for Bellefonte; those coming from the east via the Pennsylvania Railroad should change at Montandon for Lemont (State College). Trains leave Bellefonte for State College at 6:30 and 10:15 A. M. and 2:00 P. M.

**Registration.** All persons should register immediately upon arrival. The Registration and Information Office will be found in the Agricultural Building.

**General Information.** Where more than one lecture is scheduled for a period, except in the evening, such lectures will be given simultaneously. The location and number of the rooms in which the several lectures will be given are shown with each subject listed.

The following abbreviations are used:

Ag.—Agricultural Building.
Dairy—Dairy Building.
Hort.—Horticultural Building.
Pavilion—Stock-Judging Pavilion.

Rooms numbered 1 to 99 are in the basement; 100 to 199, on the first floor; 200 to 299, on the second floor; 300 to 399, on the third floor of the several buildings.

Evening lectures will be given in the Auditorium.

Practice in apple packing every day during the week from 8:30 to 11:45 A. M. and from 2:00 to 5:15 P. M. (Hort. 7).

Practice in judging corn December 29 to January 1, inclusive, from 3:45 to 5:15 P. M. (Ag. 303).

Practice in figuring fertilizer formulas December 30 to January 2, inclusive, from 10:15 to 11:45 A. M. (Ag. 207).

An exhibit covering the various phases of Home Economics activities will be found in the Woman's Building.

The Woman's Building, the Animal Husbandry, Dairy and Horse Barns, the Creamery, and other buildings will be open to visitors at all times. Arrangements will be made, however, to explain the details of the work at these various points of interest, from 3:30 to 5:15 every afternoon when visitors are especially invited.

The period from 3:30 to 5:15 any afternoon may be utilized by county delegations for get-together meetings if they so desire. Rooms will be assigned for this purpose and announcements of such meetings made upon request. In past years many counties have found these meetings of their local people helpful.

Room 109, Agricultural Building, may be used by the women as a Rest Room.

Room 5, Agricultural Building, may be used by the men as a Smoking and Rest Room.

## RECEPTION

Wednesday evening, December 30, immediately following the exercises in the Auditorium, a reception will be given in the Armory. This will be an informal gathering which will offer opportunity to visitors to become better acquainted with one another and with the members of the College staff. Everyone is invited, and it is hoped that all will help to make the evening a success by coming.

# LIST OF SPEAKERS

C. S. Adams: Agricultural Extension—Berks County.
H. S. Adams: Agricultural Extension—Butler County.
J. F. Adams: Instructor in Botany.
E. L. Anthony: Instructor in Dairy Husbandry.
E. N. Bates: Instructor in Mechanical Engineering.
S. I. Bechdel: Instructor in Dairy Husbandry.
A. R. Bechtel: Instructor in Botany.
J. R. Bechtel: Instructor in Horticulture.
R. H. Bell: Agricultural Extension—Lycoming County.
I. J. Bibby: Assistant in Dairy Husbandry.
Miss Zella Bigelow: Assistant in Home Economics.
R. U. Blasingame: Instructor in Agronomy.
E. L. Bowman: Instructor in Educational Engineering.
F. S. Bucher: Agricultural Extension—Lancaster County.
G. S. Bulkley: Instructor in Dairy Husbandry.
W. C. Coffey: Professor of Sheep Husbandry, University of Illinois.
A. W. Cowell: Associate Professor of Landscape Gardening.
F. D. Crooks: Assistant in Poultry Husbandry.
W. H. Darst: Assistant Professor of Agronomy.
B. W. Dedrick: Instructor in Milling Engineering.
L. H. Dennis: Department of Public Instruction, Harrisburg.
R. B. Dunlap: Agricultural Extension—Blair County.
G. F. Eckhard: Associate Professor of Structural Engineering.
Richard Ernesti: Associate Professor of Industrial Art and Design.
F. N. Fagan: Assistant Professor of Horticulture.
W. W. Farnsworth: Fruit Grower, Waterville, Ohio.
J. A. Ferguson: Professor of Forestry.
Lewis B. Flohr: Scientific Assistant, U. S. Department of Agriculture.
Miss Ella Forsman: Instructor in Nursing.
William Frear: Professor of Experimental Agricultural Chemistry.
F. D. Gardner: Professor of Agronomy.
C. W. Gay: Professor of Animal Husbandry, University of Pennsylvania.
Paul Gerlaugh: Instructor in Animal Husbandry.
W. C. Gillespie: Assistant in Experimental Pomology.
C. L. Goodling: Superintendent of Farms.
W. R. Gorham: Agricultural Extension
H. H. Havner: Assistant Professor of Animal Husbandry.
Joseph Heacock: Wyncote, Pennsylvania.
E. K. Hibshman: Agricultural Extension.
A. F. Hildebrandt, Gardener.
Arthur Holmes: Dean of the General Faculty.
M. G. Kains: Professor of Horticulture.
F. D. Kern: Professor of Botany.
M. C. Kilpatrick: Instructor in Poultry Husbandry.
C. W. Larson: Professor of Dairy Husbandry.
Miss Sara C. Lovejoy: Dean of Women.
C. G. McBride: Agricultural Extension—Mercer County.
M. S. McDowell: Agricultural Extension.
J. M. McKee: Agricultural Extension—Washington County.
Miss Pearl MacDonald: Agricultural Extension—Home Economics.
T. I. Mairs: Professor of Agricultural Education.
C. J. Marshall: State Veterinarian, Harrisburg, Pennsylvania.
R. A. Moore: Professor of Agronomy, University of Wisconsin.
Mrs. Rose Morgan: New York City.
J. A. Moyer: Professor of Mechanical Engineering.

C. E. Myers: Assistant Professor of Experimental Vegetable Gardening.
C. F. Noll: Assistant Professor of Experimental Agronomy.
J. L. Nix: Homer City, Pa.
C. R. Orton: Assistant Professor of Botany.
C. F. Preston: Agricultural Extension—Chester County.
F. S. Putney: Assistant Professor of Dairy Husbandry.
James E. Rice: Professor of Poultry Husbandry, Cornell University.
Emmor Roberts: Fruit Grower and Gardener, Moorestown, New Jersey.
A. B. Ross, Agricultural Extension—Bedford County.
A. K. Rothenberger: Agricultural Extension—Montgomery County.
S. C. Schmucker: West Chester Normal.
B. O. Severson: Assistant Professor of Animal Husbandry.
J. M. Sherman: Instructor in Bacteriology.
D. K. Sloan: Agricultural Extension—Bradford County.
R. S. Smith: Instructor in Agronomy.
Edwin Erle Sparks: President of The Pennsylvania State College.
Miss Welhemina Spohr: Columbia University, New York City.
F. H. Stadtmueller: State Dairy and Food Commissioner of Connecticut.
J. P. Stewart: Professor of Experimental Pomology.
C. W. Stoddart: Professor of Agricultural Chemistry.
O. M. Taylor: Horticulturist, New York Experiment Station, Geneva, N. Y.
C. W. Thompson: Specialist in Rural Organization Work, U. S. Dept. of Agriculture.
W. H. Tomhave: Professor of Animal Husbandry.
L. C. Tomkins: Agricultural Extension.
G. F. Warren: Professor of Farm Management, Cornell University.
R. L. Watts: Dean and Director, School of Agriculture and Experiment Station.
E. H. Webster: Associate Editor Hoard's Dairyman.
E. I. Wilde: Instructor in Horticulture.
J. W. White: Assistant Professor of Experimental Agronomy.
E. L. Worthen: Associate Professor of Agronomy.

## PROGRAM

### Monday, December 28

8:30 to 12:00 Noon.

Registration

11:00 A. M.

Opening Exercises (Hort. 100).

2:00 to 3:30 P. M.

| | |
|---|---|
| Soil Moisture—Its Function and Control (Hort. 202) | R. S. Smith |
| Farm Buildings (Ag. 207) | R. U. Blasingame |
| What it Costs to Maintain a Beef Breeding Herd (Ag. 206) | B. O. Severson |
| Judging Dairy Heifers (Pavilion) | E. L. Anthony |
| Fire Blight of Fruit Trees (Hort. 200) | C. R. Orton |
| Cropping Methods (Hort. 100) | Emmor Roberts |
| Increasing the Winter Yield of Eggs (Ag. 103) | M. C. Kilpatrick |
| Cooking—Lecture and Demonstration (Woman's Bldg.) | Pearl MacDonald |

3:45 to 5:15 P. M.

| | |
|---|---|
| The Crop Adaptation of Pennsylvania Soils (Hort. 100) | E. L. Worthen |
| The Potash Situation (Ag. 206) | M. S. McDowell |
| The Home Orchard (Hort. 202) | M. G. Kains |

### 7:30 P. M. (Auditorium).

| | |
|---|---|
| **Opening Address** | Edwin Erle Sparks |
| **Breeding and Dissemination of Pure Bred Seed Grains** | R. A. Moore |

## Tuesday, December 29

### 8:30 to 10:00 A. M.

| | |
|---|---|
| Crop Improvement (Old Chapel) | R. A. Moore |
| Diseases of Potatoes (Ag. 207) | C. R. Orton |
| Judging Hogs (Pavilion) | Paul Gerlaugh |
| Ice Cream Making (Dairy 251) | C. W. Larson |
| Feeding and Care of the Dairy Calf (Dairy 259) | F. S. Putney |
| Strawberries for Market (Hort. 2) | W. W. Farnsworth |
| Vegetables for Home Use (Hort. 100.) | M. G. Kains |
| Flowers for the Home Garden (Hort. 205) | E. I. Wilde |
| Artificial Incubation (Hort. 202) | J. L. Nix |
| Garment Making—Undergarments—Cutting, Making and Trimming (McAllister Hall) | Zella Bigelow |

### 10:15 to 11:45 A. M.

| | |
|---|---|
| The Management and Economical Use of Stable Manure (Hort. 200) | F. D. Gardner |
| The Limestones of Pennsylvania (Old Chapel) | William Frear |
| Draining Land (Ag. 207) | R. U. Blasingame |
| The Draft Horse for the Pennsylvania Farmer (Ag. 206) | C. W. Gay |
| Silos and Silage (Dairy 259) | S. I. Bechdel |
| Utilizing Waste Fruit and Vegetables (Hort. 100) | M. G. Kains |
| Business Roses (Hort. 205) | Joseph Heacock |
| Improving the Quality of Market Eggs (Hort. 202) | M. C. Kilpatrick |
| Textiles (McAllister Hall) | Sara C. Lovejoy |

### 2:00 to 3:30 P. M.

| | |
|---|---|
| Alfalfa (Ag. 206) | R. A. Moore |
| Judging Draft Horses (Pavilion) | H. H. Havner |
| Dairy Farm Management (Dairy 259) | F. H. Stadtmueller |
| Practice in Testing Butter for Moisture (Dairy 251) | I. J. Bibby |
| Peaches for Market (Hort. 2) | W. W. Farnsworth |
| A Successful Farmers' Exchange (Hort. 100) | Emmor Roberts |
| Growing House Plants—Demonstration (Botany Bldg.) | A. F. Hildebrandt |
| Demonstration and Practice in Dressing Poultry (Poultry Bldg.) | F. D. Crooks |
| Cooking—Lecture and Demonstration (Woman's Bldg.) | Pearl MacDonald |

### 3:45 to 5:15 P. M.

| | |
|---|---|
| Slaughtering Lambs and Swine for Home Use (Pavilion) | W. H. Tomhave |
| Advantages of Testing Cows for Advanced Registry (Dairy 259) | G. S. Bulkley |
| Buying as a Fine Art (McAllister Hall) | Sara C. Lovejoy |

### 7:30 P. M. (Auditorium).

| | |
|---|---|
| Extension Possibilities in Home Economics | Pearl MacDonald |
| The College and the Farmer | M. S. McDowell |
| The Outlook | R. L. Watts |

## Wednesday, December 30

### 8:30 to 10:00 A. M.

| | |
|---|---|
| Annual Legumes for Pennsylvania (Hort. 104) | W. H. Darst |
| The Purchase, Use and Care of Farm Machinery (Ag. 207) | C. L. Goodling |
| Feeding Farm Horses (Ag. 206) | C. W. Gay |
| Principles of Feeding Dairy Cows (Dairy 259) | F. S. Putney |
| The Outlook for the Pear (Hort. 2) | M. G. Kains |
| Marketing Vegetables (Hort. 200) | R. L. Watts |
| Village Improvement (Hort. 205) | A. W. Cowell |
| Artificial Brooding (Hort. 202) | J. L. Nix |
| Posts for Farm Fences (Ag. 103) | J. A. Ferguson |
| Garment Making—Outergarments (McAllister Hall) | Zella Bigelow |

### 10:15 to 11:45 A. M.

| | |
|---|---|
| Potato Culture (Hort. 200) | C. F. Noll |
| Concrete on the Farm (Engineering Bldg. 202) | G. F. Eckhard |
| Tobacco Culture and Experiments (Ag. 103) | E. K. Hibshman<br>William Frear |
| Feeding Beef Cattle in Pennsylvania (Ag. 206) | W. H. Tomhave |
| Keeping Books and Records on a Dairy Farm (Dairy 259) | F. H. Stadtmueller |
| Retail Marketing of Fruit (Hort. 100) | W. W. Farnsworth |
| Root Crops for Market (Hort. 2) | J. R. Bechtel |
| Greenhouse Construction and Heating (Hort. 205) | E. I. Wilde |
| Marketing Poultry Products (Hort. 202) | M. C. Kilpatrick |
| Emergencies and First Aid (McAllister Hall) | Ella Forsman |

### 2:00 to 3:30 P. M.

| | |
|---|---|
| Fertilizer Experiments—Results and Effect upon the Soil (Old Chapel) | F. D. Gardner<br>J. W. White |
| Control of Hog Cholera (Ag. 206) | C. J. Marshall |
| The Cow and the Acre (Dairy 259) | E. H. Webster |
| Currants and Gooseberries (Hort. 104) | O. M. Taylor |
| Tree Fruits (Hort. 200) | Emmor Roberts |
| Carnations for Market (Hort. 205) | Joseph Heacock |
| Demonstration and Practice in Dressing Poultry (Poultry Bldg.) | F. D. Crooks |
| The Chemistry of Spray Materials (Technical) (Ag. 207) | C. W. Stoddart |
| Cooking—Lecture and Demonstration (Woman's Bldg.) | Pearl MacDonald |

### 3:45 to 5:15 P. M.

| | |
|---|---|
| Lighting of Farm Buildings (Ag. 206) | R. U. Blasingame |
| Counting Bacteria in Milk (Dairy 256) | J. M. Sherman |
| Testing Milk for Butter Fat (Dairy 259) | S. I. Bechdel |
| Farmstead Planning and Planting (Hort. 205) | A. W. Cowell |

### 7:30 P. M. (Auditorium)

| | |
|---|---|
| Songs that Live | Rose Morgan |

Reception to Visitors (Armory)

## Thursday, December 31

### 8:30 to 10:00 A. M.

| | |
|---|---|
| Factors for Success in Farming (Hort. 100) | G. F. Warren |
| The Automobile for the Farmer (Engineering Bldg. 202) | J. A. Moyer |
| Control of Tuberculosis (Ag. 206) | C. J. Marshall |
| Practice in Figuring Rations for Dairy Cows (Dairy 259) | F. S. Putney |
| Raspberries, Dewberries and Blackberries (Hort. 104) | O. M. Taylor |
| Cabbage Cultivation (Hort. 2) | C. E. Myers |
| Demonstration and Practice in Grading Eggs (Poultry Bldg.) | F. D. Crooks |
| The Feeding and Care of Infants and Children (Woman's Bldg.) | Wilhemina Spohr |

### 10:15 to 11:45 A. M.

| | |
|---|---|
| Insect Enemies of Farm Crops and How to Control Them (Hort. 100) | W. H. Darst |
| Crop Rotations (Hort. 200) | W. R. Gorham |
| Fertilizers—Their Source and Effect (Dairy 251) | C. W. Stoddart |
| Building up and Managing a Pure Bred Herd of Swine (Ag. 206) | W. H. Tomhave |
| Handling Labor on a Dairy Farm (Dairy 259) | F. H. Stadtmueller |
| Spraying Machinery (Hort. 2) | W. C. Gillespie |
| Money Vegetable Crops (Hort. 104) | J. R. Bechtel |
| What to Do with Rural School Grounds (Hort. 205) | A. W. Cowell |
| Poultry Farm Management (Hort. 202) | James E. Rice |
| The Farm Woodlot (Ag. 103) | J. A. Ferguson |
| The Home Care of the Sick (McAllister Hall) | Ella Forsman |

### 2:00 to 3:30 P. M.

| | |
|---|---|
| Types of Farming (Hort. 100) | G. F. Warren |
| Some Opportunities in Sheep Breeding and Feeding (Ag. 206) | W. C. Coffey |
| Standardizing Dairy Farm Practices (Dairy 259) | E. H. Webster |
| Dairy Butter Making (Dairy 251) | E. L. Anthony |
| Strawberries (Hort. 104) | O. M. Taylor |
| Asparagus (Hort. 200) | C. E. Myers |
| Chrysanthemums Under Glass (Hort. 205) | E. I. Wilde |
| Recent Investigations in Poultry Husbandry (Hort. 202) | James E. Rice |
| Consolidation of Country Schools (Ag. 103) | T. I. Mairs |
| Cooking—Lecture and Demonstration (Woman's Bldg.) | Pearl MacDonald |

### 3:45 to 5:15 P. M.

| | |
|---|---|
| Farm Records and Accounts (Hort. 100) | F. D. Gardner<br>W. R. Gorham |
| Practice in Dairy Farm Butter Making (Dairy 5) | E. L. Anthony |
| Round Table Conference of Correspondence Course Students (Ag. 206) | T. I. Mairs |
| Breeding for Eggs (Hort. 202) | James E. Rice |
| Decorative Schemes for the Home—An Exhibit (Main Bldg., 266) | Richard Ernesti |

### 7:30 P. M. (Auditorium).

| | |
|---|---|
| Parcels Post—with demonstration | Lewis B. Flohr |
| The Joy of Living | S. C. Schmucker |

## Friday, January 1

### 8:30 to 10:00 A. M.

| | |
|---|---|
| The Use of Lime on Land (Old Chapel) | F. D. Gardner |
| Farm Engines—Illustrated (Engineering Bldg. 202) | E. N. Bates |
| Feeding Hogs for Market (Ag. 206) | H. H. Havner |
| Selecting a Milch Cow (Pavilion) | E. L. Anthony |
| Farmer's Fruit Storehouse (Hort. 2) | F. N. Fagan |
| Onions (Hort. 200) | J. R. Bechtel |
| Poultry Organizations and Co-operation (Hort. 202) | James E. Rice |
| Agricultural High Schools (Ag. 103) | L. H. Dennis |
| The Feeding and Care of Infants and Children (Woman's Bldg.) | Wilhemina Spohr |

### 10:15 to 11:45 A. M.

| | |
|---|---|
| The Meaning of Soil Analysis (Hort. 2) | J. W. White |
| Corn Growing and Improvement (Ag. 206) | C. F. Noll |
| The Farmer and the Miller as Co-operators (Electrical Bldg. 24) | B. W. Dedrick |
| Judging Mutton and Wool Sheep (Pavilion) | B. O. Severson |
| Co-operative Dairy Cow Testing (Dairy 259) | D. K. Sloan<br>L. C. Tomkins |
| The Planting and General Care of an Apple Orchard (Hort. 100) | J. P. Stewart |
| Tomatoes (Hort. 200) | C. E. Myers |
| Sweetpea and Violet Culture (Hort. 205) | E. I. Wilde |
| Demonstration in Grading Eggs (Poultry Bldg.) | F. D. Crooks |
| Agriculture in Schools Below the High School (Ag. 103) | T. I. Mairs |
| Theory and Practice of Disease Prevention in Plants (Technical) (Botany Bldg.) | F. D. Kern |
| Art in the Home (McAllister Hall) | Richard Ernesti |

### 2:00 to 3:30 P. M.

Fertilization of Grass Land (Hort. 200).........................C. L. Goodling
Farm Motors and Tractors (Ag. 207).........................R. U. Blasingame
Diseases of Cereals (Hort. 2).................................F. D. Kern
Sheep Management (Ag. 206).................................W. C. Coffey
Dairy Barn Building and Equipment (Dairy 259)................C. W. Larson
Fertilization of Orchards (Hort. 100).............................J. P. Stewart
Grapes (Hort. 104)...............................................F. N. Fagan
Control of Insects in Vegetable Garden (Hort. 202)...............C. E. Myers
Trees and Their Care (Hort. 205)...............................A. W. Cowell
Demonstration and Practice in Caponizing (Poultry Bldg.)........F. D. Crooks
Handiwork in Country Schools (Engineering Bldg. 202)..........E. L. Bowman
Saving Steps (McAllister Hall).............................Pearl MacDonald

### 3:45 to 5:15 P. M.

Cutting Mutton and Swine Carcasses for Home Use (Pavilion).W. H. Tomhave
Plums and Cherries (Hort. 100)...................................F. N. Fagan

### 7:30 P. M. (Auditorium).

Coöperation Among Farmers............................ ...C. W. Thompson
Character as Capital........................................Arthur Holmes

## Saturday, January 2

### 8:30 to 10:00 A. M.

The Principles of Soil Cultivation (Hort. 100)..................E. L. Worthen
Twenty Bad Weeds of Pennsylvania and Methods of Dealing With Them (Ag. 207)..................................................A. R. Bechtel
Judging Beef Cattle (Pavilion) ..............................B. O. Severson
Factors in Clean Milk Production (Dairy 259)...................C. W. Larson
Spray Materials and Spraying (Hort. 2).........................J. P. Stewart
Business Squashes (Hort. 104).................................J. R. Bechtel
The Production of Soft Roasters (Hort. 202).................M. C. Kilpatrick
The Feeding and Care of Infants and Children (Woman's Bldg)..................................................................Wilhemina Spohr

### 10:15 to 11:45 A. M.

What Varieties of Crops to Grow (Hort. 100).......................C. F. Noll
Moulds, Mildews and Mushrooms (Ag. 207)........................F. D. Kern
Common Diseases of Farm Animals (Ag. 206).................H. H. Havner
Selecting a Dairy Bull (Pavilion)................................E. L. Anthony
Diseases of Apples (Hort. 200)....................................J. F. Adams
Demonstration and Practice in Caponizing (Poultry Bldg.)......F. D. Crooks
Cooking—Lecture and demonstration (Woman's Bldg.).......Pearl MacDonald

# BOYS' PROGRAM

## Tuesday, December 29

**10:15 to 11:45 A. M.**

Judging Beef Cattle (Pavilion)............................ W. H. Tomhave
F. S. Bucher

**2:00 to 3:30 P. M.**

Selecting and Testing Seed Corn (Ag. 303).................... W. H. Darst
H. S. Adams
A. B. Ross

**3:45 to 5:15 P. M.**

Testing Milk for Butter Fat (Dairy 251)..................... S. I. Bechdel
L. C. Tomkins

## Wednesday, December 30

**8:30 to 10:00 A. M.**

Judging Horses (Pavilion).................................. H. H. Havner
C. F. Preston

**10:15 to 11:45 A. M.**

Judging Sheep (Pavilion).................................... B. O. Severson
J. M. McKee

**2:00 to 3:30 P. M.**

Practice in Sowing and Transplanting Vegetables (Green House) J. R. Bechtel
R. H. Bell

## Thursday, December 31

**8:30 to 10:00 A. M.**

Pruning and Grafting Demonstration (Green House)....... F. N. Fagan
C. G. McBride
R. B. Dunlap

**10:15 to 11:45 A. M.**

Judging Dairy Cattle (Pavilion).............................. E. L. Anthony
D. K. Sloan

**2:00 to 3:30 P. M.**

Judging Hogs (Pavilion)............................. Paul Gerlaugh
A. K. Rothenberger
C. S. Adams

**3:45 to 5:15 P. M.**

Stepping Stones to Success (Hort. 104)..........................Arthur Holmes

## Friday, January 1

**8:30 to 10:00 A. M.**

Boys' Clubs (in conference with County Superintendents and County Agents) (Hort. 104)..........................................E. K. Hibshman

**10:15 to 11:45 A. M.**

Agricultural Education (Hort. 104).................................R. L. Watts

**2:00 to 3:30 P. M.**

Selecting and Testing Seed Corn (continued) (Ag. 303)........ W. H. Darst
H. S. Adams
A. B. Ross